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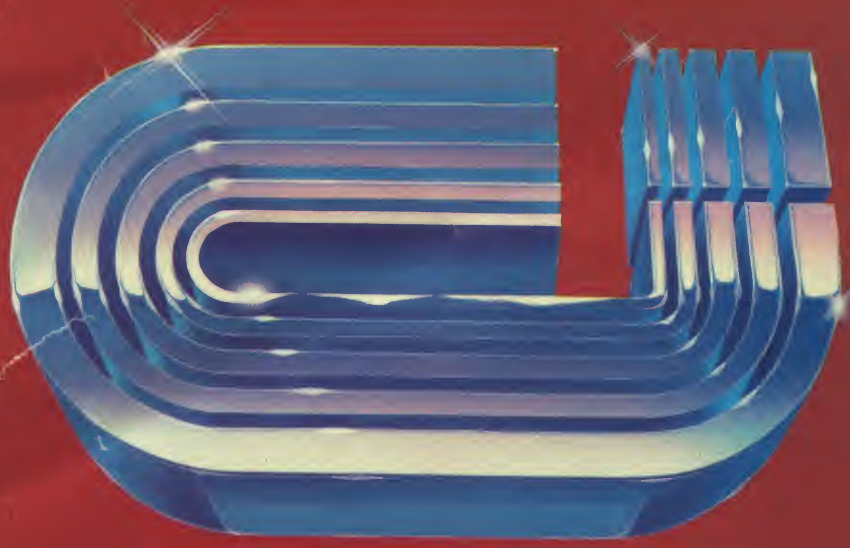
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80 Pine St.
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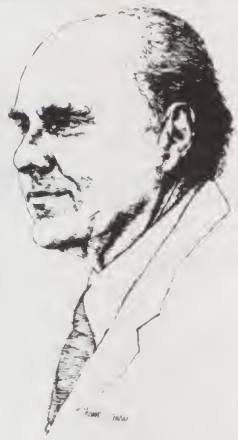
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By Wayne Green

Computer Marts: Medieval Marketing?



Bazaar Thinking

Recent articles in Computerworld about Boscom and Infomart, the planned Boston and Dallas computer merchandise mart developments, got me to ruminating, as I am wont to do. A cost of $165 million to refurbish the old Boston Commonwealth Pier and make it into a computer shopping mart? Good grief!

Methinks someone with a remarkably glib tongue must have woven some heady dreams to get that kind of dough behind such an ephemeral project. Imagine what could be accomplished if that kind of money were put to good use! Oh well, with Atari and Texas Instruments wallowing in losses of that magnitude, I suppose I should just shrug off another potential lead balloon. In the computer field, people are accustomed to both winning and losing on a large scale.

Going Back

It seems to me that the whole concept of trying to sell computer systems in a merchandise mart environment is a triumph of a medieval marketing mentality. Perhaps, upon reflection, I am being generous. The concept takes me back to bazaars in Tehran, Damascus and Baghdad.

As I wandered through the bazaar in Damascus, which claims to be the oldest continuously inhabited city in the world, I was awed by it. In one section, there were hundreds of small shoe shops. In the next were hundreds of shops selling cloth, most of it imported from China. Another section had copperware, and so on.

This type of shopping is good for the customer in that the closeness of the merchants makes it easy to find exactly what is wanted, and it's easy to bargain for it. The closeness of similar products helps to keep prices competitive. The same system has evolved in Hong Kong with microcomputer stores, with dozens in the Golden Shopping Center, all with similar products (fake Apples) and all fiercely competitive.

But in the merchandise marts—if you've ever visited one—we have quite a different situation. Here I've seen exhibits by manufacturers that are aimed at buyers for stores and chains of stores. These are wholesale, not retail. And this is not, as I read it, what is planned for the computer marts, where only the end customer is in mind as the buyer.

If the IBM people set up exhibits in Boscom and Infomart, will they be demonstrating their equipment for users or for dealers? If they are aiming at end users, are they going to actually sell directly to the customer, or are they going to just demonstrate and then tell the prospect to go find a dealer to make the actual sale?

> Are there any developments that might be a little more up-to-date-than going back to the 1000 B.C. concept of merchandising?

Dealers are not likely to be enthusiastic about direct manufacturer-to-customer sales. But without such sales, how can the enormous expense of such a display possibly be justified?

Boston's Pier

The Pier, while it is an enormous building and almost unused these days, is not near much. It's a mile or so away from downtown Boston. There's little public transportation out that way. It does have a nice parking area across the street, which is more than you can say for Hynes Auditorium, where most of the recent computer shows have been held.

Will people go that far out of the way to look at computers? Spending $165 million is a big gamble on that flimsy premise, no matter how desperate the city may be to find something to do with property. It's too out of the way to attract many shows, so most of the time it's been just sitting there, gradually rusting away.

With the rapidly changing technology, are there any developments that might be a little more up-to-date than going back to the 1000 B.C. bazaar concept of merchandising? And what will be the advantages of a mart over what we already have in computer shows?

Will potential buyers of computers and software get the same feelings of frustration that I have when I attend a show? An exhibit in a mart, whether it is for direct selling or demonstration, would have the same serious limitations for me.

When I wander around a computer show and see enthusiastic manufacturers showing their hardware and software, I know two things immediately.

One, these birds know their products cold—and that means that they are going to be able to show off all positive aspects and razzle-dazzle to me. Two, they know the bugs and limitations and will be able to easily hide these from me, even if I am fairly perceptive.

I learned long ago not to believe demonstrations at shows. That's like expecting a used car dealer to start listing the problems I can expect if I buy a car from him—it isn't going to happen. Used horse and camel dealers wrote the book ages ago, and it's still alive and well at computer shows—and presumably at computer marts, too. No thanks.

Be Honest . . .

With the complexity of the programs being sold today, it isn't practical to plan on trying them out personally. It takes weeks to get really familiar with programs like VisiCalc, so what can you do

in five or ten minutes in a store, at a show or even in a mart? And, be honest about this, how can you hope to compare SuperCalc 3, Lotus 1-2-3, MBA and other such incredibly complex programs in a few hours?

Yes, of course, I have some ideas on how to tackle the problem, and for one hell of a lot less than the $165 million refurbishing of that old pier in Boston. And that doesn't count the incredible investment in renting space, setting up and maintaining permanent exhibits and the personnel to man them.

One way around this silly extravagance would be for the manufacturers of hardware and software to prepare video tapes demonstrating their products. With some entertaining talent to show off the product, we customers could sit in comfort in a computer store and watch a video presentation that would show us everything and a half that the product could do. With an interactive video disk, it could even branch to show us specific applications that might be in tune with our particular needs. As expensive as video is, it doesn't hold a candle to the cost of exhibiting in a mart.

With both Xerox and IBM said to be planning to rent mart space for about $1 million per year in Boscom, plus another $1 million a year for the display and personnel (minimum), they would have to sell nearly $100,000 a day,

There really has to be a better way to sell computers than endless shows or computer marts. Can't someone come up with something better?

average, just to pay for this extravagance . . . never mind any profits.

Building Up Stamina

One of the benefits of realizing the impossibility of making decisions on computers or software at shows is that it has speeded up my ability to see them. I recently was able to cover most of a 24-building computer show in Munich in one single day. It had me almost looking forward to the Las Vegas Comdex show (November 28–December 2), with its 5,850 booths.

I did get practiced up a few days ago, though, starting with that 24-building Munich show to get my wind, flying the next day via Anchorage, AK, to Tokyo and the Data Show, then to 180 exhibits at the Singapore PerComp Asia '83 show and finally to the 960-booth Comdex Europe at Amsterdam.

Comdex Europe—A Lonely Show

The Munich, Tokyo and Singapore shows were crowded, so getting around was a hassle. Fortunately, the Comdex show was virtually empty, so getting around was a breeze.

For the second straight year, the show was almost deserted. One would begin to expect some resistance on the part of exhibitors to spend all of that money just to stand around and talk with each other. Perhaps the lure of an all-expense paid trip to Amsterdam is all it takes to get American exhibitors—never mind that there are virtually no customers.

One problem, of course, is that few dealers cross a border in Europe. If you want to sell in Germany, you exhibit in Germany—hence the huge show in Munich and the incredibly big Hannover Fair each spring. France? You exhibit at one of the Paris shows. Holland is a nice country, but it's small, and you can count the computer stores in one breath, so even if every one of them had come to the show—which they didn't—they would have been lost in the empty spaces. It was nice, though, to be able to get a badge without any wait at all a few minutes after the opening of the show. At NCC you'd have to wait an hour.

The educated opinion was that a Comdex show in Amsterdam is never going to be worthwhile. I missed the 1982 disaster, which conflicted with a show in Hong Kong, but apparently the 1983 version was a close approximation. The newspaper reports last year were not exaggerated.

The Comdex people, not one bit dismayed by their second Amsterdam catastrophe, have announced plans to invade Japan. Hey, good luck, Shelly! The Tokyo Comdex is scheduled for March or April '85, with no date yet firm.

Shelly has also announced a third Comdex in the U.S. . . . just what the industry needs! As I wrote earlier, there really has to be a better way to sell computers than endless shows or computer marts. Can't someone come up with something better?

One last observation on shows: it does seem as if the firms that put on the biggest displays invariably end up going out of business shortly thereafter. This wisdom was making the rounds at the Munich Systems show, where Victor must have spent $100,000 on a party—a huge affair at the most expensive hotel in the city. I was there having dinner in the same hotel and I saw it with my own eyes.

Now how can German sales support such an extravagance—as well as the huge Victor exhibit at the show? Well, at least they had the good sense to avoid Comdex—as did Apple, Tandy, IBM, Vector, NorthStar, CompuPro, NEC and so on.□

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Thomas Bonoma, *Microcomputing*
Dec. '83, p 22

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Jerry Pournelle, *Byte Magazine*
April '83, p 234

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LETTERS TO THE EDITOR

Some Tips for Osborne

I read Edward Mitchell's article "Debug Your Osborne Software" in the October issue of *Microcomputing* (p. 74) and was interested in some of the statements made there since I implemented the CP/M BIOS for the Toshiba T200/T250 line of computers, which have a memory-mapped screen and terminal emulation also.

Mr. Mitchell and all Basic users under CP/M should be aware that many Basics do character I/O through CP/M BDOS function calls. One side effect of this is that the BDOS monitors the output stream and keeps track of the output position. When it receives a TAB character (09), it spaces out to the next MOD 8 character position. It does this to support Type and other low-level output utilities that don't have the intelligence to perform primitive output formatting on their own.

The implication of this is that the character 09 shouldn't be sent unless you want CP/M to get in the way.

One way out of this is to do all character I/O (especially cursor positioning) through direct BIOS calls. This has the side effect of speeding up character I/O substantially. Some Basics already do their character I/O through BIOS calls.

The other way is to offset the x coordinates that have a value of less than a space by a number that is terminal dependent. Terminal makers have recognized that many machines have difficulty sending characters less than 20H, so they make provision for it. In the case of the Toshiba machine that has Hazeltine emulation, the x offset for x coordinates less than 20H was 60H or 96. Possibly the same value would work for the Osborne.

I hope this information is helpful to people doing cursor positioning under CP/M using Basic.

David W. Harralson
Yorba Linda, CA

Bar Code Fever

I was pleased with Joseph Verzino's article "Say It in Bar Code," (September *Microcomputing*, p. 36). However, I do have a question. Are there any products available to read or decode bar code and to input bar code one way or another into a VIC-20?

If not, have there been any books or magazine articles that explain "how to do it yourself"? I am very interested in obtaining such a capability.

Colin C. Kelly, Jr.
15 Sotelo Ave.
Piedmont, CA 94611

TS Is OK

First of all I want to say that I enjoy *Microcomputing* and read it cover to cover. However, after reading "Publisher's Remarks" in the November issue (p. 6), I was a little upset about some of the remarks made in regard to the Timex/Sinclair computer.

Here are a few things that I think should be known: First of all, being a new computer on the market, it is hard to have magazines, books and hardware and software available right then and there.

There are currently, however, magazines and books for the Timex/Sinclair 1000. And yes, there *are* third-party companies that are currently supporting hardware and software for the "little" computer.

Also, I would like to point out that the computer was introduced as a computer to help people learn Basic.

Timex also offers a toll-free number for assistance in programming and new product information, and the people are pleasant and helpful.

Just once I would like to read something positive about this small but powerful computer, especially now that the 2000 is available.

Bryan J. Mobley
Akron, OH

An Overwhelming Response

The response to my request for pen pals (October *Microcomputing*, "Letters to the Editor," p. 30) was overwhelming. I've received more than 1000 letters so far.

Members of my local user's group and I are currently developing a special newsletter (nonprofit) for all our friends worldwide who enjoy using their Timex/Sinclair, Commodore, Radio Shack and Adam computers.

We invite users of all ages and interests to donate informative articles to our readers and a special Classified section for users is available with a members' rate of ten cents per word (minimum ten words).

Our yearly rate is $10 for 12 issues and all proceeds go directly to continue the newsletter.

Chris Elsasser
Box 635 Rt 2
Camilla GA 31730

Microcomputing encourages readers to express their opinions and viewpoints in its "Letters to the Editor" forum.

Letters should be double-spaced and sent to *Microcomputing* magazine, "Letters to the Editor," 80 Pine St., Peterborough, NH 03458; or contact us on CompuServe (70116,752) or SourceMail (ST8283).

Sneak Previews

One of the hottest issues of 1984 will be compatibility between computers. The February issue of *Microcomputing* will examine the truths and myths of compatibility with a number of practical and informative articles. We've recently seen a lower-court decision overturn Franklin Computer Corp.'s earlier victory over Apple regarding the Franklin's unabashed emulation of the Apple. What implications does this have for microcomputer manufacturers and the buying public?

Our introductory article by Rick Cook entitled "What Do You Mean, 'Compatible'?" will set the stage for the issue. Tom Howe will report on a new coprocessor board, the Plus 88, that allows the Kaypro II to run some IBM PC software. He'll have some interesting observations.

If you have a supply of TRS-80 cassette tapes (but no TRS-80!) then you will enjoy our article on reading TRS-80 cassettes into a nonTRS-80 machine. This program and simple hardware project will astonish those who believe the TRS-80 is a machine unto itself.

Our big system news is an early review of the Dimension 68000. The machine is touted as being able to handle the TRS-80, Apple, IBM PC, UNIX and CP/M-based software. We're testing one now and will report to you our findings next month.

There's more for February. We are also planning some late-breaking stories that we can't even tell you about . . . yet. See you next month!

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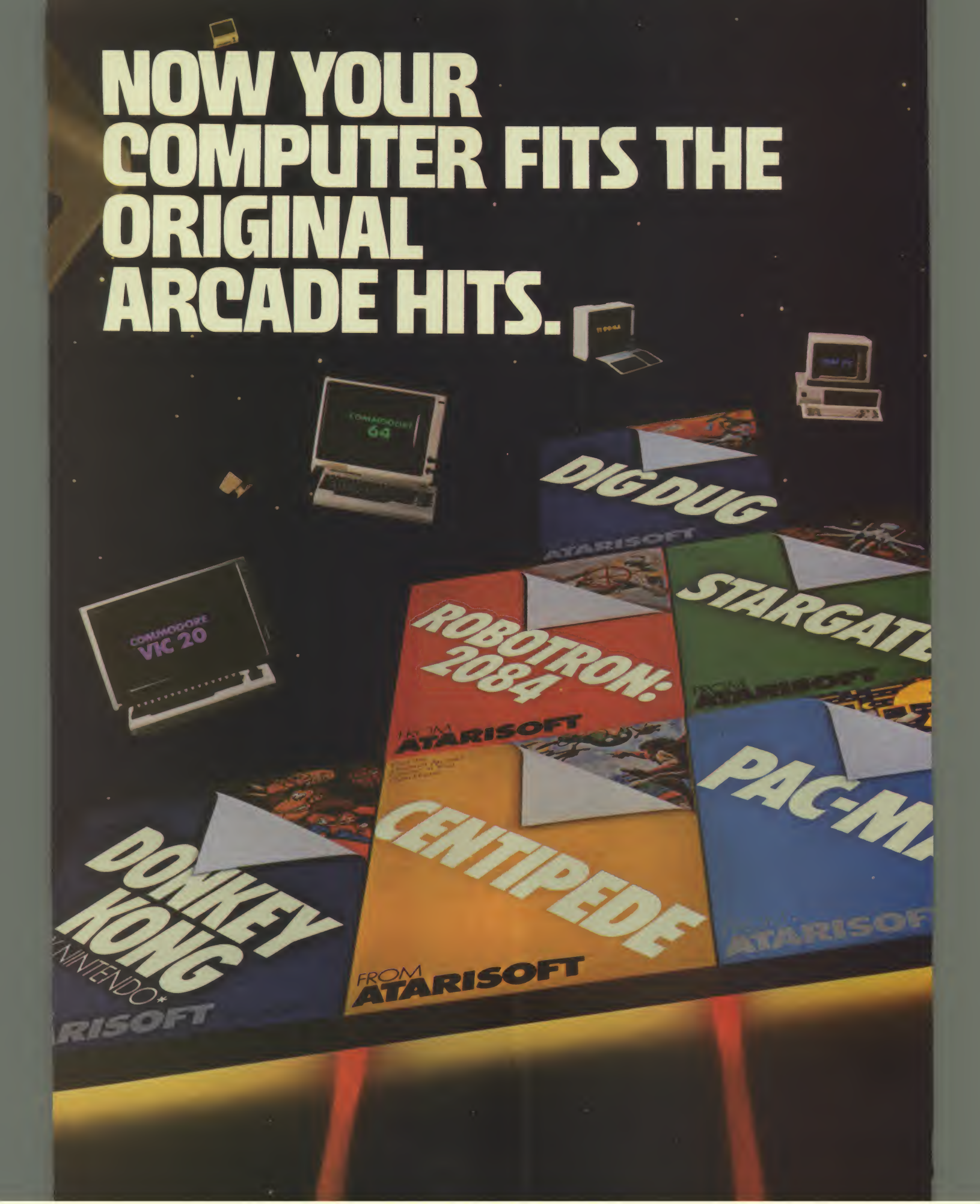
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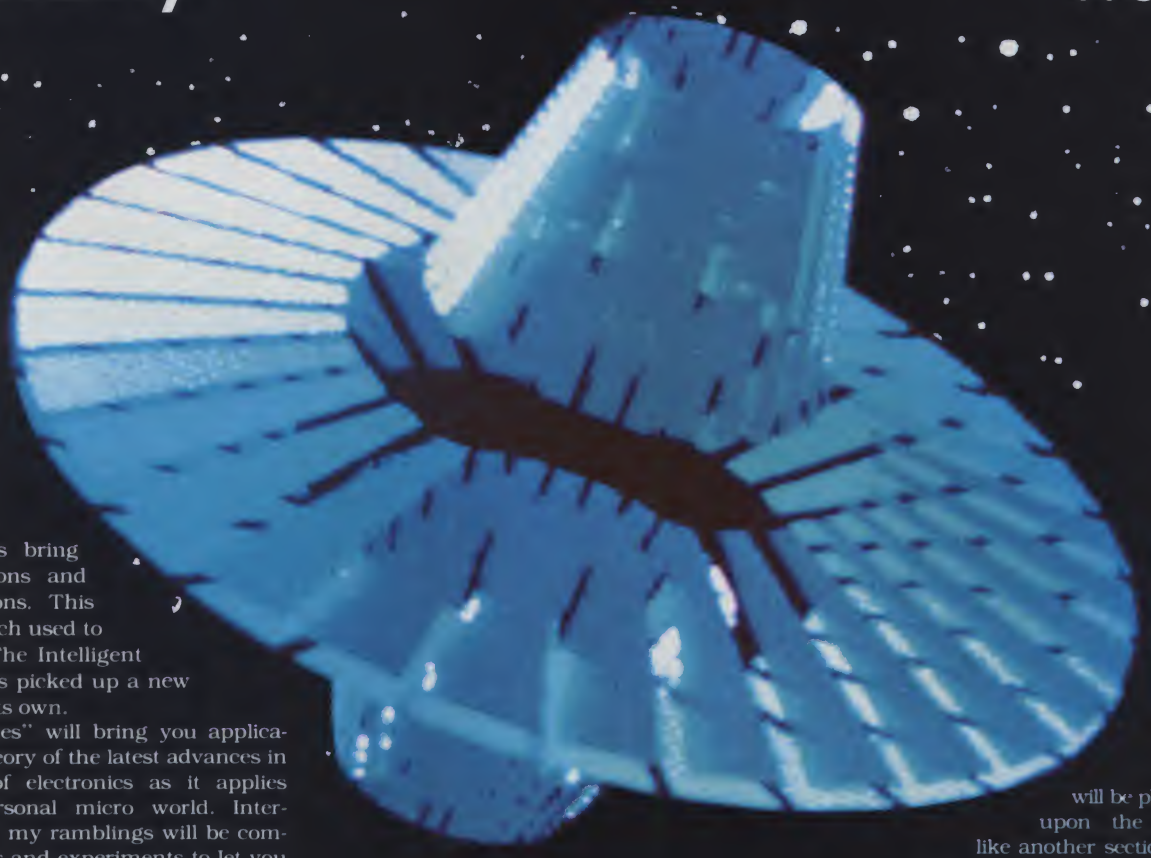
ASM 10

Circle 58 on Reader Service card.

By Mark J. Robillard

The Graphics Galaxy

"Specsmanship" The Creative Way



New years bring new ambitions and new directions. This column, which used to be called "The Intelligent Toaster," has picked up a new direction of its own.

"Techniques" will bring you applications and theory of the latest advances in the world of electronics as it applies to your personal micro world. Interspersed with my ramblings will be complete projects and experiments to let you participate in the research without leaving your house.

As always, I welcome your comments, suggestions and criticisms and I'll try to incorporate them into some of the monthly columns throughout the year.

This month, we'll tie into this issue's theme of computer graphics. There are no construction details, just an introduction to the various techniques used by the industry to produce those fine imaginative fantasies captured on film, like the one shown on this page. This picture was generated by Ken Utting, a Sanders Associates employee.

Utting was using, as a display terminal, a Calcomp/Sanders Vistagraphic 4218. This display provides 256 simultaneous colors over a resolution of 640×512 pixels. Utting was running under Vistagraf (a Core-like subroutine package supplied by Calcomp). The shading was produced by running a version of Brigham Young University's MOVIE.BYU, which was cleverly modified by Calcomp's Jan Silverman.

Pixels, Core, Silverman . . .
(or, What's This Guy Talking About?)

If you haven't been part of, or haven't been introduced to, the computer graphics community, the last paragraph was probably a blur to you. Don't feel alone—the field is relatively young, but it's emerging rapidly.

Trying to explain architecture types is like taking a picture of a road race. With everything advancing so rapidly, you tend to get distorted images.

The place to start, I guess, is where the computer leaves off and the graphics begin.

I assume that readers of *Microcomputing* are familiar with the standard structure of a computer. The processor communicates over some type of data path, called a bus, to storage devices, such as disks and memory. It also uses this bus to communicate with the outside world through RS-232C interfaces and the like.

Well, consider that a graphics interface will be placed upon the bus like another section of memory (Fig. 1). This memory however, can be viewed directly by the operator. To draw images, then, all you have to do is arrange the data being stored in this memory to represent the structure of that image.

The graphics interface, or graphics processor, as it is called by industry people, takes the stored data from this memory on the bus and sends it serially to a display head that is nothing more than a color or monochrome monitor. As you can imagine, the design of this processor is quite complex and, like I said, is forever being improved upon by companies in the field. It's not a trivial task to design one from scratch.

What I want to accomplish here is

Mark Robillard is a Principal Engineer/Program Manager for Sanders/Calcomp in Hudson, NH. You may contact him at MJR Digital, PO Box 630, Townsend, MA 01469.



Calcomp Graphics Development System.

to make some sense out of manufacturers' specifications for graphics boards. I'll also cover the various techniques used to accomplish these specs.

At the close of the article is a list of reference books on the subject of graphics design theory. You will find, through these, that there is far too much detail than could be brought out in a single article.

Specifications

Now that you're done admiring the picture, let's examine the specifications of the display (Fig. 2) used to produce it. Calcomp is a typical graphics supplier; you'll find similar specifications for interfaces among all levels of equipment.

In the upper left portion of the data sheet, you'll find that several models are provided (not important) and that each is divided by something called "interlace" and "noninterlace" (very important).

Let me explain the actions and differences between the two.

TV or raster-type displays move an electron beam across the face of the display. From this sweeping motion comes the name "Raster displays." To illustrate this point, look at Fig. 3—the classic representation of television operation.

The electron beam starts in the upper left corner of the screen and is moved from left to right. When it reaches the right, it is swept back to the left side. However, when it's traveling left, the beam moves downward slightly. In this way, we end up with a series of parallel horizontal lines.

In a standard TV image, there are 525 horizontal scan lines that are laid down in the fashion explained above before the beam must return to the upper left again.

Noninterlaced displays move and place the beam just the way I have described it. They place all 525 lines on the screen 60 times per second. So each individual scan line, or, for that matter, each individual time interval (pixel), is being rewritten (refreshed) at a 60Hz rate.

Noninterlaced display monitors are fast because they accept pixel data (on/off) at a rate that supports the 60Hz refresh.

On the other hand, interlaced displays cut the speed in half. How do they do this? They write the odd-numbered scan lines first, then, on the second pass, they write the even lines.

Although half of the lines are actually being refreshed at the 60Hz rate, the entire picture is being updated at only a 30Hz rate. Therefore, pixel on/off data is being accessed at only half the rate as before.

The differences between the two are many. Interlaced displays tend to flicker. When a white-colored ball is displayed on a black background, the ball surface will produce a beating effect on your eyes. This type of display is cheaper and not as bright.

The noninterlaced display, which represents the direction the industry is heading, is brighter and virtually flicker-free. As you can see from the data sheet in Fig. 2, the display is offered in both varieties. Expect the noninterlace to cost more . . . it's worth it!

Pixels at Last

Those horizontal scan lines come out looking like a series of dots across the face of the tube. These little dots, known as pixels, aren't a disease, or a design problem with the monitor. They're actually supposed to be there. In fact, designers can't get enough of them!

You see, the graphics processor is keeping time from the moment he leaves the beam on the left to the moment he jerks it back (retrace). This scan must be done in a precise amount of time.

Although the main actions being performed so far are start sweep and retrace, there is no reason the processor can't be doing something else in between. In fact, anything it does in between will automatically be in sync with the traces. Why not get on/off data from a memory and

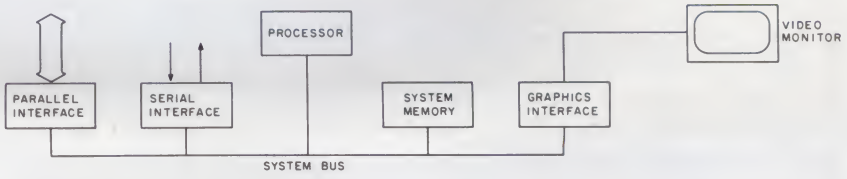


Fig. 1. Placement of a graphics interface on a standard micro system bus.

display it a piece at a time? (No, we didn't invent something here; they've been doing that for years.)

If you look up "pixels" in a computer dictionary, it will say "the smallest addressable point on a raster display."

We haven't started on addressing yet; we're still out at the monitor, following the scan lines. I'm sure you get the idea, though—a digital controller marches through display memory, location by location, fetching data to send to the monitor before the next retrace cycle.

Each one of these "elements of time" is defined as fractions of a second. The faster they are, the more you can fit across the screen in the allotted time. The Calcomp display boasts the ability to put 640 of them on a line (Calcomp even has one that displays twice that much). Typical personal computers have been limited to 256 for normal TV viewing, yet the more business-oriented models, like the IBM PC, are supporting 640.

Shades and Color

Getting back to the spec sheet, there is another important factor in specifying a graphics interface.

Across from the model numbers is listed the amount of colors or gray shades available. When discussing pixels, I never mentioned the fact that the electron beam inside the monitor has the ability to vary in intensity, providing different levels of brightness.

As you might guess, varying the beam is an analog function. To get more than one value of analog voltage requires more than one digital signal. TTL-level signals are either on or off; that's the case in all computer systems.

Through the use of digital-to-analog (D/A) converters, two or more bits of digital data may be transformed into varying levels of current, which then can be converted into a video signal with multiple intensities.

> The real test is to find out how fast your graphics interface can draw a vector.

By now you should have figured out that placing two bits into a D/A converter will yield those four shades provided by the model 4212.

While we're on the subject of multiple bits-per-pixel, let's explore the organization of pixel memory. As I mentioned, more than one bit representing a pixel can result in more than one shade. In graphics systems, each bit is referred to as a plane. Therefore, to display 16 shades would require a "×4" memory, or four bit-planes.

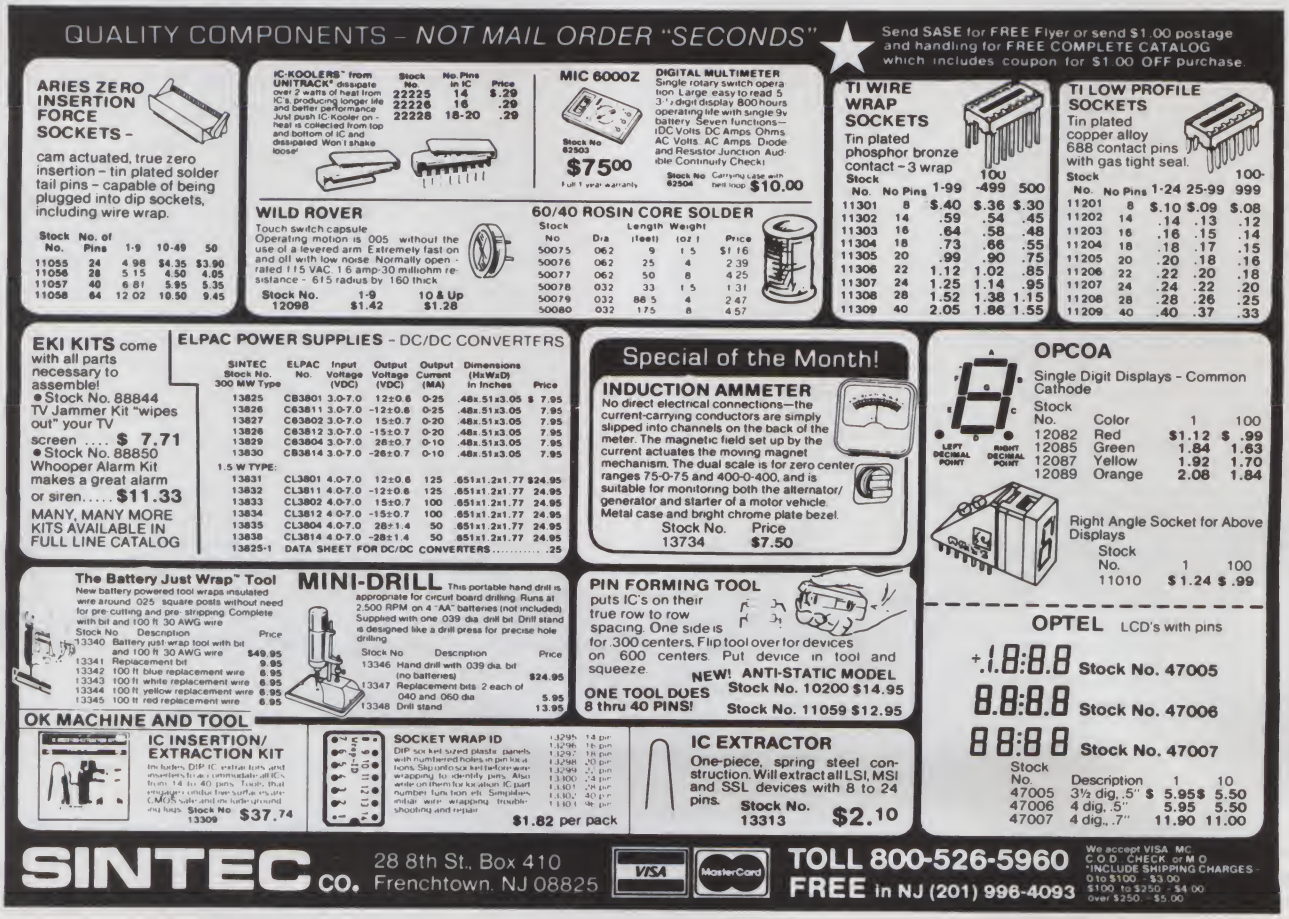
Each pixel on the screen is associated with one discrete addressable location in pixel memory. In a 640×512 system, there are 327,680 of them! That same 16-shade system will require a memory arranged as approximately 400K×4. Fig. 4 illustrates the organization and the actions of the D/A converter.

It's possible to choose those 16 shades from a larger selection through the use of something called a look-up table (Fig. 5), which is a smaller memory (usually a high-speed static RAM). This technique is used on color displays.

You might have noticed that personal computers that display close to the resolution of the Calcomp unit use RGB monitors.

In a television system, all colors are made up of varying quantities of the colors red, green and blue. The tube in the monitor has three electron guns inside. Yes, a three-bit plane system could drive a color monitor; however, going with straight TTL yields only eight colors. In fact, that is exactly how many low-end

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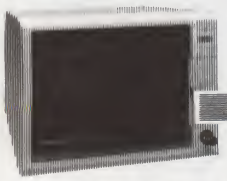
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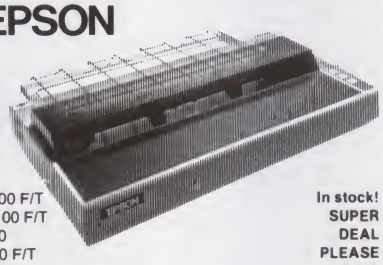
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business graphics terminals generate their colors.

Linking the look-up table idea into those same three-bit planes will allow you to dynamically change the values coming out to the monitor. Remember, the table is a section of memory also.

To illustrate the look-up table's operation, let's return to the Calcomp system. The display shown in the beginning of this article was produced with 256 colors or shades of blue. The 4218 is an eight-bit plane system that uses a 12-bit look-up table.

The digital outputs of each bit plane in pixel memory are combined into one eight-bit byte. This byte is now used to address the look-up table memory. Because it involves eight-bits, 256 separate locations may be addressed.

At each of these locations are three sets of four outputs. These outputs then go into D/A converters to produce the colors. Each D/A converter corresponds to one of the red, green and blue CRT guns.

Because there are 16 possible combinations of shades coming out of the table (four-bits) and there are 256 possible amounts of these, a color palette of 4096 colors is available!

Speed, Pixel Flash and Vectors

So far, we've been talking about tremendous amounts of memory. We've also been discussing only one picture.

As you get further into this, you'll begin to wonder how fast you can draw a picture. After all, 400,000 memory locations don't get updated all at once. In fact, if you were to leave the pixel memory on the bus for processor access and graphics processor access, there would appear a northeast snow storm on the monitor screen. This is known as pixel flash.

In inexpensive personal computers, you can see pixel flash. When Basic is writing to the screen, you can also see pixels move in jumps.

Industrial users of graphics get around these problems by providing two pixel memories. One is updated while the other is being displayed. They flip-flop on and off of the main bus to give constant access to the processor. This technique is called double-buffering, and it's right above the look-up table on the spec sheet.

The next item is pixel writing speed. This is where creative "specsmanship" comes in. You'll see all kinds of numbers beside the pixel update time spec. The Calcomp unit is, at its fastest, around 350 nanoseconds. That's pretty fast, but are individual pixel speeds important?

SPECS

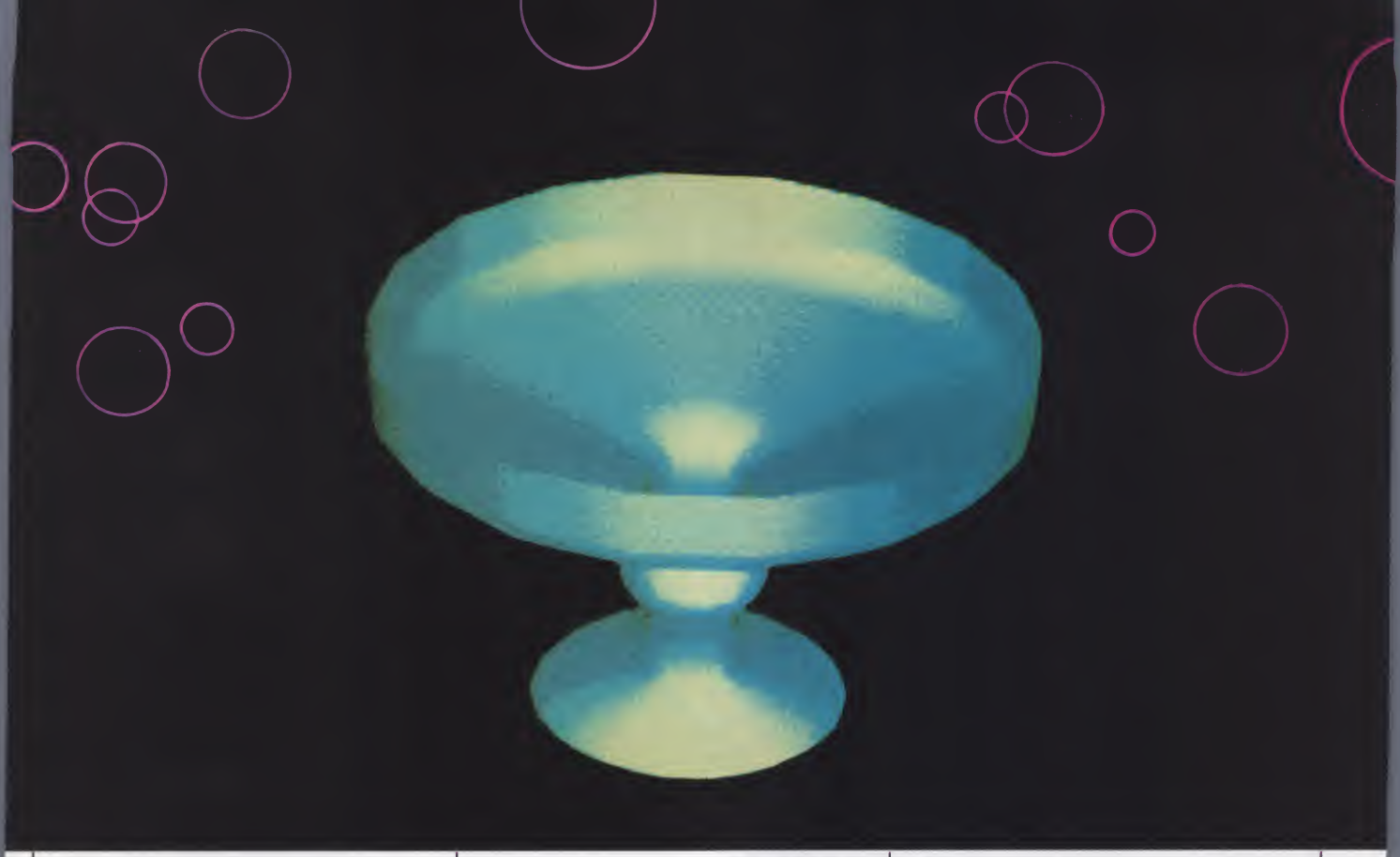
Specifications

Vistagraphic™ 4200 Graphic Display Terminals

General:	
Color Models	
4213 30 Hz Interlace	16 Colors
4214 60 Hz Noninterlace	16 Colors
4218 60 Hz Noninterlace	256 Colors
Monochrome Models	
4211 30 Hz Interlace	2 Shades
4212 60 Hz Noninterlace	4 Shades
Double-Buffered Pixel Memory	
Look-Up Table (Color Palette)	4096
Display:	
CRT Size	19 in
Resolution	640 x 512
Character Sizes	3
Pixel Update Times	
Horizontal Vector	0.35-2.5 μsec
Vertical Vector	2.5 μsec
45° Vector	3.6 μsec
Processor/Memory:	
System Processor (MC68000)	16/32 bit
Display List/Program Memory (RAM)	128K bytes
RAM Expansion Memory	up to 1M bytes
Program Memory (EPROM)	32K bytes
Interfaces:	
RS-232C asynchronous	110-19,200 baud
Parallel interfaces to most computers	
Peripherals:	Alphanumeric/Function Keyboard (Standard) Data Tablet Joystick Forcestick Trackball Monochrome Screen Copier
Software:	FORTRAN Support Package (FSP)
Enclosures:	Pedestal Expanded Pedestal Expanded Rack Mountable Card Cage Display Monitor Rack Mounting

Firmware:	Graphic Control Program (GCP) TTY mode, Local debug, Built-In Test
Graphic Functions:	
Graphic Instructions	Absolute and relative vectors Absolute and relative dots Circle generation Complex Polygon fill Picture Element Read/Write 2D Scale and Translate Selective Bit Plane Overlay/Underlay
Character Instructions	96 ASCII upper and lower case Programmable line and tab spacing Horizontal and vertical orientation
Environmental:	
Power	
Standard	120 VAC ±10%, 60 Hz
Optional	220 VAC ±10%, 50 Hz 100 VAC ±10%, 60 Hz 240 VAC ±10%, 50 Hz 100 VAC ±10%, 50 Hz
Dimensions	
CRT Display	15.8 x 21.4 x 23.2 in/401 x 544 x 589 mm
CRT Display (Rack Mountable)	17.5 x 19.0 x 21.5 in/445 x 483 x 546 mm
Pedestal	3.3 x 21.4 x 23.2 in/84 x 544 x 589 mm
Expanded Pedestal	5.8 x 21.4 x 23.2 in/147 x 544 x 589 mm
Card Cage	10.0 x 17.3 x 17.5 in/254 x 438 x 445 mm
Keyboard	3.3 x 18.8 x 8.1 in/84 x 478 x 206 mm
Weight	
CRT Display	70 lbs/32 kg
CRT Display (Rack Mountable)	60 lbs/27 kg
Pedestal	25 lbs/11 kg
Expanded Pedestal	35 lbs/16 kg
Card Cage	35 lbs/16 kg
Keyboard	7 lbs/3 kg
Temperature	
Operating	+50°F to +104°F/+10°C to +40°C
Storage	+14°F to +158°F/−10°C to +70°C
Humidity (non-condensing)	10%-90%
Altitude	0 to 10,000 ft/0 to 3,048 m
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Fig. 2. Reproduction of the Calcomp Vistagraphic 4200 Display data sheet.



The real test is to find out how fast your graphics interface can draw a vector (a short or long line on the screen). Nobody tells what the distance is, and most don't tell you that it takes 40 times the speed listed to set up before drawing the first pixel! They also don't tell you whether the vector is being scaled, zoomed or clipped.

The best rule of thumb is to ask the vendor: "How long does it take to produce a fully transformed 1cm vector?" and "How many can you display in one second?" Watch the salesman sink to the floor.

I'm going to wrap this up for now by referring to the picture of a fully loaded Calcomp graphics system (see p. 13). The photo shows the 4218, hard disk unit and various peripherals.

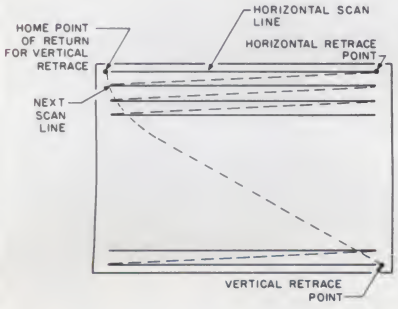


Fig. 3. Representation of the beam movements on a standard television monitor.

If you need more information on the design of these terminals, refer to the books listed below:

- *Fundamentals of Interactive Computer Graphics*
 J.D. Foley, A. Van Dam
 Addison-Wesley

- *Tutorial: Computer Graphics*
 Kellog S. Booth
 IEEE Computer Society

- *Computer Graphics Primer*
 Mitchell Waite
 Howard W. Sams & Co., Inc.

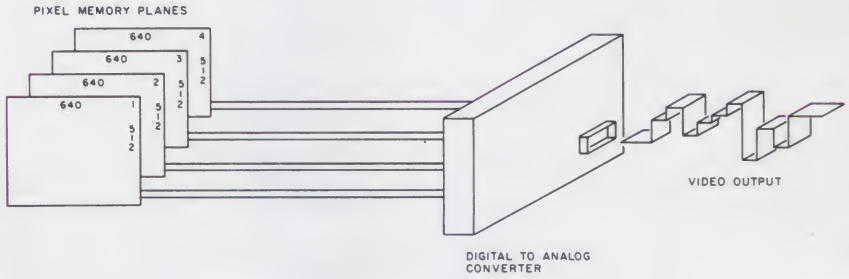


Fig. 4. Diagram showing the use of multiple memory planes to achieve varying video levels.

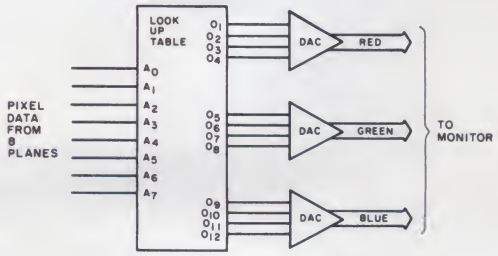


Fig. 5. Use and actions of the color look-up table.

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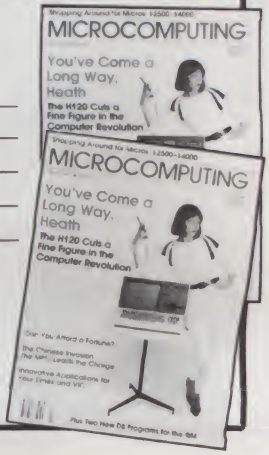
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By Robert W. Baker

The Answer For Mailing Jobs

PS: It's Commodore's EasyMail 64

EasyMail 64

If you need a mail list program that handles around 700 names and addresses for your small business, Commodores's EasyMail 64 may be your answer. It requires a C-64, a 1541 disk and a 1525 printer.

EasyMail's ten-page manual uses a tutorial approach. When the program begins, you have a chance to change the screen color combinations via the function keys. After you enter the current date when prompted, the program is ready to accept commands.

From this point on, you can enter, display, alter, delete or print name and address entries. You also can initialize disks, display disk status or print mailing labels.

A highlighted program status line is always displayed at the bottom of the screen. This line indicates when the computer is busy and reminds you of certain actions or functions. At any time, you can press the run/stop key to access a help screen that lists the available commands and functions.

Each entry has fixed length fields to accommodate a name, a four-line address, the state or province, zip code, phone number and a special category field that can be up to eight characters long.

New EasyMail Entries

When making new entries, use the cursor keys to return to previously typed fields to make changes. If you're satisfied with the entire contents, the entry can be accepted and written to disk. When accepted, each entry is automatically assigned a sequential EasyMail reference number used to locate individual entries.

To display a specific entry, you can either enter the specific EasyMail 64 reference number or search on any specific field when the reference number isn't known. When searching for specific entries, you can continue from one match to the next or stop at any time. The actual searching uses only the leading characters of the data for matching, so you can easily look for specific groups of entries.

There are two ways of printing the entries. You can list them onto plain paper in a report format or you can print mailing labels.

Both printings allow pattern matching, so you can limit the data to be printed to only those matching a specific data pattern in one particular field. Both also allow sorting the file using one key field that you select.

When printing labels, you can print one or two across a page. There's even a special feature to help align labels in the printer.

The program will print the first set of labels and pause to see if you think the labels are aligned. If not, EasyMail 64 will print the first set of labels again and repeat the question.

Easy Handling

EasyMail easily handles the job it is designed for, but it definitely would not be suitable for any reasonably sized business or club mailing list. Search and sorting times can be long, especially when a large amount of data has been entered. For the average home user with a 50- to 150-entry address list, though, this program should be more than adequate.

(By the way, a RapidForms order blank is included with the program for ordering mailing labels if your local dealer doesn't handle them.)

The Word Machine And the Name Machine

These two Commodore programs come on disk in the same package for the Commodore-64.

The Word Machine is a mini word processor that allows you to write, save, edit and print documents or letters in your choice of formats. The Name Machine is a mini mailing list program that makes your computer an electronic telephone book, a source of mailing labels and a tool for generating a batch mailing list. As an added bonus, you get a copy of the DOS Wedge on the same disk.

Both programs are written in Basic and are menu-driven for ease of use. You can use a datassette or a Commodore disk for data storage along with a Commodore printer for printed output.

By the way, both programs actually will run on any PET or CBM system with 16K memory (if you ignore the color prompts), even though they're packaged for the C-64.

Word Machine, Step by Step

The Word Machine's 14-page manual is divided into two sections.

Section I is a tutorial that provides a step-by-step introduction to the essential functions of the program. It describes each of the options (which allow you to create, save, recall, print, display and edit documents) available from the main menu screen. Other options include global searches and replacements and form letter processing.

When printing a document, you have three choices on format: formal, informal and draft.

Formal provides 72-character lines with a letterhead and date plus salutation for formal letters. Informal provides 72-

Address correspondence to Robert Baker, 45 Windsor Drive, Atco, NJ 08004.

character lines with the name of the document at the top of each page. Draft provides double-spaced, 60-character lines with the name of the document at the top of the page.

Section II of the manual provides a user supplement that defines access to the program's more advanced features. It provides information necessary for personalizing the program to your needs, and it describes how to use other printers, how to change the default letterhead and how to use tabs.

Name Machine Features

The Name Machine allows you to create, save, edit and print the name, address and telephone number of approximately 150 correspondents at one time. The six-page manual is structured just like the one for the Word Machine, providing tutorial and user supplement sections along with a quick reference guide.

Both programs provide only the most basic functions with little or no options, but they are extremely simple to use.

If you're willing to spend the time to learn how to use a full-function word processor, something like Easy Script, Word Pro or Paper Clip would be much more practical than the Word Machine. For mailing lists, EasyMail 64 would be a much better choice and not much harder to use.

This assumes you're using them on a C-64, of course, since none of these will work on a PET or CBM, while the Word Machine and the Name Machine will.

Vidtex

CompuServe recently announced the availability of a new PET/CBM version of its intelligent terminal emulator program, Vidtex.

This program makes the PET/CBM into a Vidtex terminal complete with capture buffer, error-free file transfer using the CompuServe B protocol, ten programmable function keys, a powerful autolog-on capability, full printer support, an ASCII standard keyboard and video driver, video cursor control and block graphics.

Vidtex is supplied on disk with executives for both the IEEE-488 modem and the user port-based RS-232C modem. It requires 32K memory with at least one disk and will run on a 4032, 8032, a FAT40 (modified for 80-column screens) and Graphics 80. The printed documentation is excellent—almost 40 pages with a complete index and glossary plus several examples.

CompuServe recently announced the availability of a new PET/CBM version of its intelligent terminal emulator program, Vidtex.

Vidtex uses its own keyboard decoder, which redefines the OFF/RVS key as the control key found on most terminals. Thus, you can easily generate all of the normal control functions used for starting and stopping displayed output, interrupting the operating system, deleting characters or lines and so on.

The keyboard decoder also provides "meta" keys by using CLR/HOME. The meta key is used for local operations only and usually does not transmit anything to the host computer.

Computer-Controlled Cursor

Vidtex contains its own video driver that allows it to perform high-level video functions, such as not breaking words across lines. It also allows the host computer to control the position of the cursor on the screen through special cursor-control sequences.

Vidtex normally won't start a word on the right-hand edge of the screen and finish it on the beginning of the following line. Instead, the entire word will be moved to the start of the next line and any part of the word that was on the previous line will be erased. This makes it much easier for you to read text that is wider than your screen width.

The video driver even lets you define the size and location of the text display window. Normally, the size of the window is your entire screen, but you can limit it to any specific region. However, the window must be at least four lines by 11 columns in size. When the window is in effect, all new text will appear inside of it, including the menu and help pages.

If you have a printer connected to your system IEEE-488 bus, you can use it to obtain hard copy with Vidtex. Special meta keys are used to start and stop the printing of data.

While printing received data, standard XON/XOFF flow control is used to ensure that no data is lost from the host computer, but this will tend to slow things down. You can also print a copy of the entire screen at any time via another meta key.

Vidtex's Function Keys

Vidtex provides ten function keys that you can define as any arbitrary text string you choose, such as frequently typed commands. The function keys are implemented via meta keys and you can display or modify the current definitions at any time. You can even keep several sets of definitions with different filenames on disk at one time.

The load and save functions let you load different definitions for different needs, giving you a virtually unlimited number of function keys. The only restriction is that the total number of characters for all function keys within one set cannot exceed 255.

Vidtex allows you to save a copy of all characters received in the unused portion of RAM (the RAM buffer). This is also known as "data capturing," since data is saved instead of being discarded as soon as it is received.

The RAM buffer allows you to capture text from the host so that you can save it for future reference. A number of meta keys allow for opening and closing of the RAM buffer, saving a copy of the screen in the RAM buffer, viewing the RAM buffer contents, transmitting the RAM buffer or saving the RAM buffer to disk.

```
100 REM RE-NEW PROGRAM FOR THE COMMODORE-64
110 REM
120 REM CALL RE-NEW FUNCTION BY 'SYS 50000'
130 REM
140 :
150 FOR I=0 TO 62: READ D: POKE 50000+I,D: NEXT
160 :
170 DATA 165,43,164,44,133,34,132,35
180 DATA 160,3,200,177,34,208,251,200
190 DATA 152,24,101,34,160,0,145,43
200 DATA 165,35,105,0,200,145,43,136
210 DATA 162,3,230,34,208,2,230,35
220 DATA 177,34,208,244,202,208,243,165
230 DATA 34,105,2,133,45,165,35,105
240 DATA 0,133,46,76,99,166,96
READY.
```

Listing 1. Re-New program for the Commodore-64.

When transmitting RAM buffer contents, you can transmit the entire buffer or initiate a prompted transmission with one line transmitted at a time. When executing a prompted transmission, Vidtex waits for receipt of your defined prompt character from the host computer before sending the next line. This makes it easy to enter messages into a special interest group on CompuServe.

There are two ways to save the RAM buffer to disk—edited and unedited. The edited save converts the ASCII data in the RAM buffer to be PET/CBM printer compatible. This mode should be used for saving data for processing by another program, such as VisiCalc or WordPro. The unedited save will save a copy of exactly what is received. The unedited save should be used for keeping text that you want to view later with the Vidtex program.

One of the most interesting features of Vidtex is its autolog capabilities. The autolog sequence is programmed to wait for a specified prompt string from the host and then to send a response string, normally used for logging onto the host system. However, autolog can be used for many other things as well.

The prompt-seeking function allows Vidtex to act in the place of the keyboard to provide a response to a host program. The response from autolog can be any text, control characters or even a command to Vidtex to perform almost any of the local meta functions. Special meta functions are also available for entering delays of a half-second, two seconds or any multiple or combination.

As if that weren't enough, the execution of a new autolog file may be started from an already executing autolog file. This capacity allows you to create an autolog sequence in multiple files, chaining from one to another. If you need to change part of the sequence, you only have to recreate the file containing that part.

CompuServe Capabilities

Most of CompuServe's Vidtex programs contain the ability to transfer a file from the remote system's disk to CompuServe or in the other direction. While this is a common feature found in many other terminal programs, most of them merely transmit the contents of the file or write exactly what is received.

Vidtex uses an error-free communications protocol to perform file transfers. This means that if noise occurs on the communications line, the error will be detected and corrected.

There are three types of file transfers that can occur: text, binary and machine specific.

A text transfer is used to transfer ASCII text files, such as untokenized Basic programs and text files produced by word processing programs. A binary transfer is used to transfer eight-bit files, such as tokenized Basic programs and machine language programs. This can also be used to transfer most systems' Basic data files. A machine-specific transfer is used to transfer machine-dependent files.

List Before Running

Before running the Vidtex program, you're instructed to list the program and check the options available in the first 11 lines. These options allow you to specify such things as the number of columns per line to be output to the printer, the device number for the printer, modem cable-type specification and the interface baud rate.

Be careful in making changes—you cannot add or delete any characters to change the size of the Basic portion of the program. The major portion of the Vidtex program is written in machine language and resides immediately above the Basic portion. Any changes to the Basic program that modify its size will destroy the machine language portion.

Unfortunately, the program does not support the particular RS-232C interface type I use, so I was not able to try it out.

From the description of the various features in the manual, I would think that this is an excellent and almost necessary terminal package for any PET/CBM owner intending to use CompuServe. For more information, you can write CompuServe's corporate headquarters at 5000 Arlington Centre Blvd., PO Box 20212, Columbus, OH 43220.

Vidtex uses an error-free communications protocol to perform file transfers. This means that if noise occurs on the communications line, the error will be detected and corrected.

Commodore-64 Utilities

Commodore-64 owners may find these two short utility programs useful.

The shorter program, Re-New (Listing 1) is from the PET Benelux Exchange. When loaded and run, this Basic program stores a short machine language subroutine in high RAM, starting at location 50000 decimal.

Once stored in RAM, this subroutine can be called using a SYS 50000 command to reclaim a Basic program lost by accidentally typing New.

```
10 REM EASY SCRIPT SOURCE FILE PRINTER
20 REM       FOR COMMODORE-64
30 REM
40 REM       BY: ROBERT BAKER
50 REM
60 :
70 LM=20
80 PRINT"■EASY SCRIPT SOURCE FILE PRINTER":PRINT
90 INPUT"ENTER FILENAME";FL$
100 OPEN 15,8,15
110 OPEN 2,8,2,"0:"+FL$+",SEQ,R"
120 INPUT#15,EN,EM$,ET,ES
130 IF EN<>0 THEN 270
140 OPEN 7,4,7: PRINT#7: CLOSE 7
150 OPEN 4,4
160 PRINT#4,SPC(LM);: X=0
170 GET#2,C$: IF ST<>0 THEN 290
180 IF C$="" THEN 170
190 IF ASC(C$)=13 THEN 210
200 PRINT#4,C$;: X=X+1: IF X<40 THEN 170
210 PRINT#4
220 GET C$: IF C$="" THEN 160
230 PRINT: PRINT "PRESS ANY KEY TO CONTINUE, 'Q' TO QUIT"
240 GET C$: IF C$="" THEN 240
250 IF C$="Q" THEN 300
260 GOTO 160
270 PRINT: PRINT"DISK ERROR"
280 PRINT EN;EM$,ET;ES: GOTO 300
290 IF ST<>64 THEN PRINT "ERROR *** ST=";ST
300 CLOSE 2: CLOSE 15: PRINT#4: CLOSE 4
```

Listing 2. Easy Script source file printer for the Commodore-64.

One disadvantage is that the subroutine must be loaded before it's needed. Also, the SYS call must be made immediately after typing New or chances are that the Basic program will be destroyed.

The second program provides a printed copy of disk source files created by Easy Script (Listing 2), including all imbedded commands. It makes editing extremely easy, especially when marking material for someone else to type for you. For anyone without a copy of Easy Script, this program provides a simple method of reading Easy Script files that may exist on various user group disks.

Disk files created by Easy Script are sequential data files, with data stored as standard ASCII characters. Any line not terminated with a return character when creating the Easy Script file is space filled to the end of the 40-column line. This is why Easy Script warns about leaving blank lines in files; 39 bytes per line are wasted.

This program is set to print a 40-column line centered on an 80-column page using a standard Commodore printer as device #4 on the serial bus. The variable LM in line 70 defines the offset from the left margin prior to printing each line.

The filename of the desired Easy Script file is obtained in line 90 and the disk error channel is opened along with the correct file. If the specified file exists, the program then proceeds to set up the printer.

The Open command in line 140 using a secondary channel number of 7 is used to set the Commodore printer into upper/lowercase mode. This ensures that printed output is identical to what is displayed when running Easy Script and displaying or editing a file.

The program then cycles through the main loop (lines 160–210), reading and printing characters until the end of the file is encountered. Null characters are discarded while all others are counted to limit each line to 40 characters maximum.

At the end of each line, a check is made for keyboard input to allow pausing of printed output. Once a key is pressed, you can press Q to quit printing the current file or press any other key to continue printing.

According to Commodore, the Bally Midway game Lazarian was the most difficult arcade version they've programmed to date.

If you want to conserve paper, you can move the printout to the left margin and allow up to 80 characters per line. The only changes required are to switch the value of LM from 20 to 0 in line 70 and to switch the 40 in line 200 to 80. Now large blocks of text will make full use of the 80-column page, but your printed output will not match the Easy Script display.

If you're not using a Commodore printer, you'll probably have to delete line 140 and possibly change line 150, especially if you're using a serial printer. The data probably will not print exactly as displayed by Easy Script, but you should at least be able to read it.

If you want to display the file instead of printing it, delete line 140 and change line 150 to Open 4,3 to open the output file to the display screen.

Quickies

In my November column, I mentioned Mike Todd's ICPUG piece on disk compatibility. Apparently, Mike made two slight errors in calculating the addresses for the fixes. The first fix listed, for those using a 4040 disk to write a disk that has already been written on by a 1540/1541, should be:

PRINT#15,"M-W";CHR$(157);CHR$(16);CHR$(1);CHR$(8)

The second fix, for those who already have a disk that produces read errors (Error 22), should have been:

PRINT#15,"M-W";CHR$(92);CHR$(52);CHR$(1);CHR$(31)

This fix allows additional retries, giving the drive a better chance of a successful read.

If you're having difficulties using a 1541 or upgraded 1540 disk with a VIC-20 system, remember to switch the drive from C-64 speed to VIC-20 speed. You can do this easily at the start of a program when the command channel is opened by:

OPEN 15,8,15,"UI-"

Lazarian in Cartridge

Commodore recently introduced a C-64 cartridge version of the Bally Midway arcade game Lazarian. According to Commodore, this was the most difficult arcade conversion they've programmed to date.

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home use, and Commodore believes that conversions for any other computer could not match the standard of Lazarian on the C-64. The conversion requires sophisticated graphics, elaborate musical arrangements and complex movement to precisely duplicate the arcade experience.

Lazarian presents game players with five different games to test their skill. In Mission 1, your task is to rescue a sister ship trapped in a circular force field of meteors. Once the ship is rescued, you have to shoot all of the meteors to escape.

Mission 2 involves saving another ship trapped in the complex multilevel Tunnel of Fear. You must overcome several unusual obstacles to free the trapped vessel.

In Mission 3, you face Lazarian, a menacing galactic leviathan. To triumph, you must free the controlling eye of Lazarian and then destroy the eye.

Lazarian presents Commodore programmers and game players with a special challenge. One of its features—and it's useful to novices and arcade veterans alike—is the Hit Fire To Continue option. This option allows the player to continue the game after losing all of his ships, continuing at the same level with a new supply of ships but a zero score.

Direct-Mail CBM Club

Commodore is establishing a computer club as a direct mail program for end users to provide mutual support and product availability. It'll be publishing a newsletter based on the concept of providing a user group meeting within the pages, with exchange of letters, advice from experts and product profiles. In addition, the newsletter will be supplemented by an SIG on CompuServe available exclusively for registered club members.

The products part is a direct marketing program to supplement Commodore's current distribution. It will make its complete product line available at prices reasonable enough but still high enough so that dealers won't be hurt. Since most stores carry only a small fraction of the Commodore line, this will help people buy the products they want.

Commodore will also be adding products, such as third-party books, promotional goodies (T-shirts and dust covers) and specialty products (e.g., an automatic home weather station).

At Income Tax Time . . .

Northland Accounting has released three new income tax preparation programs, collectively called TaxAid, for C-64 and VIC-20 computers. These programs were written by experienced tax accountants and are designed for home use.

The programs come with a detailed manual that leads you, step-by-step, through the data entry. The tax data is then permanently filed on tape or disk and can be recalled at any time. The program will compute and prepare a line-by-line readout of the IRS 1040 form and related schedules. Updates for future tax years are also being planned on a yearly basis.

TaxAid I runs on the unexpanded VIC-20 and prepares form 1040 and schedules A and G. This limited version prepares only screen displays and not printed output. It lists for $19.95 on tape and $24.95 on disk.

TaxAid II runs on the VIC-20 with 16K memory expansion and can provide printed output besides the displayed information. It computes form 1040 and schedules A, B and G and lists for $24.95 on tape or $29.95 on disk.

TaxAid III runs on the C-64 and can compute forms 1040 and schedules A, B, D and G. The program will output results to the screen or printer. List price for this version is $24.95 on tape or $29.95 on disk.

For additional information, write to Northland Accounting, Inc., Software Development, 606 Second Ave., Two Harbors, MN 55616.

Bowling, Anyone?

Some time ago, I reviewed a bowling league secretary's program from Briley Software for PET and CBM systems. Well, the Leaguebowl series is now available for Commodore-64 and VIC-20 systems, and newer versions for the PET and CBM are available, too. Depending on which Commodore system you use, Leaguebowl will handle up to 40 teams and provides a bundle of options.

Leaguebowl actually *calculates* league competition (in contrast to similar programs that simply allow you to enter all individual scores and all team scores and all win/loss information, and then print the information for you). With Leaguebowl, you enter the schedule for one session and the individual scores just bowled to get complete results. This includes handicaps, team competition, individual highs, 10/25 and match point scoring.

Leaguebowl retails for $160 on disk, while the optional Archivebowl and Recapbowl programs for season summaries and recap sheets are $45 each.

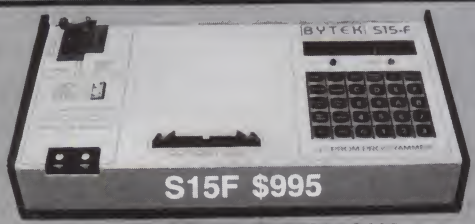
The newer C-64 version is super; it handles up to 36 teams with 360 bowlers maximum. The VIC-20 version requires 29K RAM memory and supports up to 250 bowlers.

For more information on these and other programs for the complete Commodore line, write Briley Software, PO Box 2913, Livermore, CA 94550-0291, or see your local dealer.□

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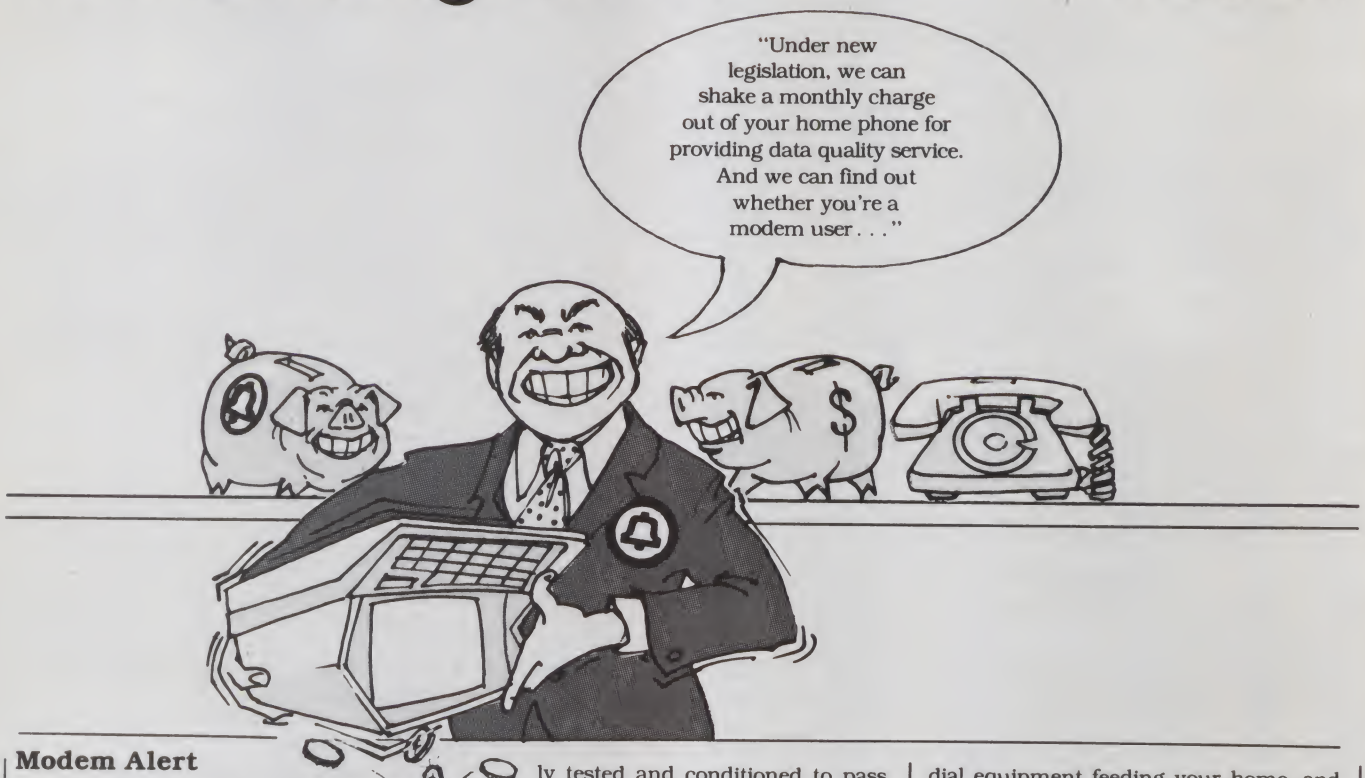
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By Frank J. Derfler, Jr.

For Whom The Bell Toll Charges . . .

. . . It Tolls For Thee, Modem



Modem Alert

Here's an important message for all of you past readers of Dial-up Directory and present users of modems. Your local telephone company may be getting ready to raise your monthly telephone rate substantially simply because you use a modem.

As part of the break-up of AT&T, local telephone companies have received permission to impose special rates on anyone using the local telephone network for data communications.

This near-sighted piece of legislation is an attempt to repay local companies for the loss of revenues from long-distance toll charges. It may, however, have the effect of severely slowing the communications revolution and limiting the use of data communications in both the home and office.

Heavy Levy?

Basically, the phone company can levy a new monthly surcharge on your home phone for providing "data quality" service. This is supposed to mean that the circuits between the local dial central office and your phone have been specially tested and conditioned to pass data traffic.

Only your phone company knows for sure if your lines have really received this special attention; there is no way you can really tell. Frankly, this testing and conditioning would be a waste of time for most of us because of the transmission rates we use and error rates we can accept.

The phone company can find out if you are a modem user either by checking the records of those who registered modems with them or by finding the tones present during routine maintenance.

There is, however, a logical argument for this added charge. It may not be an argument that appeals to you if you are a modem user, but it must be answered.

Let's say that you live in Chicago and use a modem to contact the CompuServe information utility. Your call goes over the local telephone system to a CompuServe network entry point in Chicago. At that point your signal is mixed with many others and sent over privately owned or leased circuits to the CompuServe computer center in Ohio.

Your local telephone company has a huge investment in the cable system and dial equipment feeding your home, and they have high costs for upkeep and new installations, but they get no special portion of the money you pay to CompuServe for the long-distance transmission.

Your local telephone company may be getting ready to raise your monthly telephone rate substantially simply because you use a modem.

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.

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The local telephone company may even acknowledge that your data call really doesn't cost any more to pass through its system than a standard voice call, but it claims it has to make a buck here and there to offset the otherwise undervalued cost of installation and maintenance.

You'd Better Watch Out

If you quickly respond that each installation charge should be based on the real costs, you had better watch out. Believe me, it costs a great deal more than the preset $20–$50 installation charge to extend telephone service to your home. If installations are billed at their real costs, millions of Americans will not be able to afford a telephone, and a major pillar of our economy will be shattered.

Americans consider reliable communications to be a right. It's probably too late to convince them that it is a luxury affordable only by those in urban areas close to the telephone central office. If basic service is to be low-cost and affordable, then special service must have a special cost.

There isn't a clear answer to this dilemma. One thing is certain, however, and that is that you can still have a voice in this matter. A great deal of legislation is being developed by Congress, and local utility commissions will have some input into the problem.

One alternative plan being considered would require long-haul carriers like MCI, Sprint and CompuServe to pay a high rate to local telephone companies for their service. Of course, MCI and the other alternative carriers wouldn't like this solution, but it might be a reasonable resolution. Note too that the new unshackled AT&T has yet to weigh in.

In the meantime, if you're hit with this new charge, I advise you to complain vigorously. Only squeaky wheels get greased.

The Tax Man Wears a Red Suit

You may think that it's the time for holiday decorations and colored lights, but many people think it's also time to get ready for the preparation of 1983 tax returns. There are some actions you have to take before December 31 to be ready for April 15. If you don't make the right decisions, you could pay hundreds or even thousands of dollars more in taxes than you need to.

Make the Most of Your Micro

I recently studied the purchase of a new house. The tax considerations of financing a house are both big and complex. Over the past four years, I have written in this space that microcomputers are best used when they hold, sort and manipulate data for decision-making and problem-solving, so I decided to practice what I preach and use my IBM PC to analyze the options involved.

Analysis of this kind requires the proper software. I set up a spreadsheet using 1-2-3 to run the numbers, but I found that there was a great deal I still had to do on paper and that I was never certain that I had not forgotten some important factor.

These nagging suspicions were reinforced when I found that I consistently forgot to subtract the standard deduction from my itemized deductions when I did my first "what if" tests. I decided to look for some off-the-shelf software that would help me figure out what my tax picture would look like under various alternatives.

When you look for tax preparation software, you find that it is divided into two distinct classes: 1) very complete and very expensive, and 2) less complete but much less expensive.

If you feel you can profit from a close analysis of your tax position, Tax Mini-Miser and Eagle Tax Decisions will certainly help you make that analysis.

The first class of software is marketed for CPAs working with clients. It will do practically everything for the professional tax preparer, including prompting for certain special schedules and printing all schedules and forms so they are literally ready to sign and mail. These programs cost several thousands of dollars and are certainly worth it to their professional users. But most of us don't want to invest thousands of dollars just to save hundreds.

The second type of software is aimed at the individual user or at the professional who wants to analyze different situations for clients interested in real estate, IRA or other investments. This type of software will help you to make some decisions by taking you through a series of questions and forcing you to find the answers. After you have developed the basic numbers, you can make changes to see how different actions will affect your tax picture.

These programs will add the numbers you provide, but they will not give much more in the way of advice. They assume that you know or are willing to learn how the income tax system works. Still, programs like this add discipline and accuracy to the "what if" tax analysis process, and they also may improve the process by displaying the results in several useful ways.

Tale of Two Tax Programs

I tried two tax analysis programs that are available for several different computer systems. I found them both to be valuable, but let's see how they stack up against each other.

● Tax Mini-Miser—This program is marketed by Sunrise Software in San Francisco. It was first released in 1981 and is available for Apple II, Apple III and IBM computers. I used the IBM version.

Tax Mini-Miser is written in Pascal and it comes ready to run. The disk is copy-protected, but Sunrise Software will send you a back-up disk when you register the master.

Because of its Pascal environment, this package is not tailored to any one computer. For instance, the arrow keys on the IBM PC don't work with the program. You use the I, J, K and M to move the cursor, regardless of what computer you are using. This may keep things simple for the programmer, but it doesn't make you feel that you're using the full power of your system.

The program is menu-driven, but the menu steps are clear, and you don't have to pass through too many menus before you get some work done.

Tax Mini-Miser will allow you to construct six alternative tax plans per client. Data is entered through the use of various dedicated screen sets. Questions are flashed on the bottom of the screen, and you provide the needed answers.

The first screen set gathers personal information. This data is demographic—such as the number of dependents you have and your filing status. The second screen set deals with income, and the third wants to know all about your deductions.

As you move through the screens, you find that the program just wants a number to work with—it doesn't provide advice. You have to know what deductions are allowable, how to compute such factors as sales tax and what type of depreciation to take. The program can only crank out the results based on the numbers you put in.

After you answer the program's questions, you can easily change items in the list to see the results. A special Sensitivity Analysis menu selection allows you to see the results of any number of changes without permanently altering your basic data. This function is fast and certainly is the most useful and powerful part of the program.

Tax Mini-Miser is strong in the area of tax computation. The program will compute your tax bill using the regular tables and schedules, the income averaging method or the alternative tax method. If you have computed your taxes using income averaging, you know what a tedious job it is. This program does it quickly and provides you with a comparison of the alternatives.

The reports printed by Mini-Miser contain all of the data you put in for each major plan (but not the variables you tried in the sensitivity analysis). The reports are lengthy, but they can serve as a valuable aid when you actually sit down to make out your tax forms.

The accounting firm of Price Waterhouse has looked at Tax Mini-Miser and has certified that it does what the manual claims it will do on the day it was tested. The program comes with documentation that provides helpful hints and includes an annotated description of how the program functions.

For more information on Tax Mini-Miser, contact Sunrise Software, 1056 Chestnut St., San Francisco, CA 94109. The program has a retail price of $295. Updates are expected to cost between $50 and $70. Don't ask me if the costs are deductible!

● Eagle Tax Decisions—Eagle Software Publishing has released a number of programs for persons interested in personal finance. Eagle's Money Decisions series can provide answers to many questions on loans, amortization rates, payments and those other funny numbers that are so important when you're making a buying decision. It's a two-volume set with fine documentation.

Eagle Software has expanded its series with a package called Tax Decisions. Tax Decisions also has a useful output program. You can either print summary reports of the options you tried or you can print an entire 1040 for the option you like. The IBM PC version of the program will produce some nice bar charts on the system printer showing the differences between the plans you have developed.

On the negative side, it's a little more tedious to do a sensitivity analysis using Decisions is similar in many ways to Mini-Miser—it won't make a decision for you and you have to know quite a bit about taxes before you can really use the program. It does, however, do a few things differently. The program comes with its own customized Basic interpreter. Ready-to-run versions are available for the IBM, DEC, Wang and Victor computers.

The format for Tax Decisions revolves around the Federal 1040 tax form. As you fill in the numbers in this program, you are actually following the sequence of inputs in the 1040. This improves the ease of entry because the sequence is familiar to many of us, and you can easily pick unchanged data from an old 1040 to use in the program.

A menu selection that can provide you with the forms that feed the 1040 is also available. You can enter data into any of 16 schedules and forms. You aren't told when to use the schedules or their exact functions, but they are available if you know what to do with them.

Tax Decisions. You have to run through a series of menus for each change, and that slows down the process.

Also, although I'm no expert, it appears to me that this program does not show you the differences in the alternative tax methods as clearly as Tax Mini-Miser does. You're left with the decision to proceed on income averaging instead of seeing the results immediately. (On the other hand, to compute income averaging, you need a lot of data that you might not really need to gather and enter!)

The entire Eagle Software series has some of the most handsome documentation in the industry. Screen photos, artwork and color are used to illlustrate points. The documentation is nicely contained in easily used binders.

The Tax Decisions software package is available from Eagle Software Publishing, Inc., #409, 993 Old Eagle School Road, Wayne, PA 19087 (phone 215-964-8660). The retail price is $229. Updates are free for the first year and updates for new tax laws are scheduled to run about $99 per year.

These tax computation programs clearly aren't for everyone, but if you feel you can profit from a close analysis of your tax position, they'll certainly help you make that analysis.

Remember, though, that *you* have to supply the judgment—the computer can do only the computing.□

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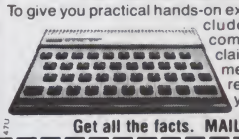
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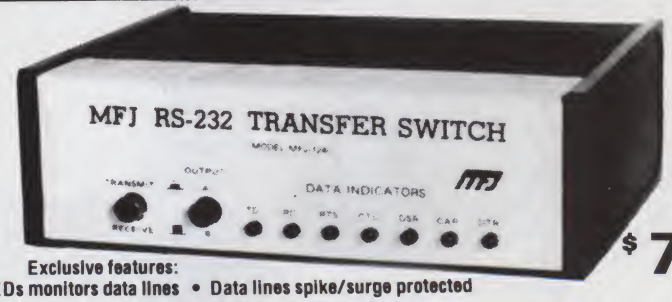
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By Thomas V. Bonoma

Thumbing Through Disk Magazines

And Shuffling Through the Software Stack

Getting Personal

The electronic age is starting to impose on me. In addition to enough PC magazines arriving on my doorstep each month to heat my house, there are now three disk magazines competing for my blurry eyes. In order of arrival, they are *PC Disk Magazine*, *I.B.Magazette* and *Mentor*.

The Message Is on the Media

PCDM ($29.95/issue, $160/six issues) is a slick, hard-documentation-supported single disk that in its premiere issue offers ten programs and one data file.

Among the more notable programs is a configurator for WordStar written by John Schnell. There is a nice little disk management utility from Peter Norton; *PCDM* also features a data file on demographics from the Bureau of the Census.

I.B.Magazette (IBM—$15/issue, $80/six issues) is by far the most hobbyist-oriented of the three electronic magazines and is structured to encourage a two-way running dialog between you and its editorial staff. Its programs are more reminiscent of early PC user's groups and public-domain software than either of the other two entries. It offers such titles as Regression and List but also incorporates a novel demo mode so you can see how the program runs while you read the (disk-based) documentation.

Mentor ($19.95/issue, $99/six issues) is the fattest of the three. It includes a VisiWord demonstration disk and three magazine disks that allow you to modify your dBaseII for full color, create a data file for the same program and get a new PROKEY file for Basic programming.

The Pros and Cons

The main advantage of any disk-based magazine is that you don't have to key in the programs. The disadvantage is that in many ways the medium gets in the way of the message, unless the programs are really good and really useful. From what I've seen so far, I might be tempted to part with my money for *Mentor*, but not so tempted with regard to *PCDM*. I'll wait and see on *I.B.Magazette*. I find all three of them high-priced for what they deliver.

Utilities and Stuff

Bruce Marshall may be slick, but he's also good. He's the author of ReadiWriter, a good word processing system for the PC. His newest offering is ReadiScope, a disk-alignment utility that eliminates the need for a technician, oscilloscope and a service visit. You can, as Bruce says, do it yourself.

His package seems expensive until you get a price quote on a disk alignment and consider the down time involved when those platters stop spinning; then it looks pretty cheap.

I delayed longer than Bruce was comfortable with before recommending this package to you; it's not for the novice or even the casual user. But, if you belong to a user's group, have drives that are giving you trouble or help others with hardware problems, you should look at Bruce's package.

He makes disk alignment as easy as changing the oil in your car. If you're comfortable with taking the cover off your machine, this package is for you—if not, let a professional do your alignment.

Punctuation and Style

Perhaps you'll remember my review of the Word+, a spelling checker, anagram solver, synonym finder and the like for WordStar and other word processing programs. Its companion program, Punctuation and Style, has been released, and it's good.

P&S has two modules: Cleanup and Phrase. Cleanup finds incorrect, missing or extra punctuation, doubled words (Paris in the the Spring), missing capitalization, incorrect abbreviation and other common punctuation errors.

Phrase is a style checker; it's supplied with a dictionary of "wrong" phrases in several common error types (overuse of passive voice, awkward phrases, cliches, erroneous phrases, pompous or redundant ones and even wordy ones); it will (a) mark your document with its complaint and/or (b) suggest corrections (but not make them).

The usefulness of Cleanup and Phrase depends on the skills of the writer composing the original manuscript. If he doesn't make the kinds of mistakes covered in Cleanup, for instance, that program isn't useful. As for Phrase, it is a more personal program . . . the program will flag as an error, for instance, the phrase "very, very nice" as redundant. As the program documentation notes, this may or may not be a redundant phrase, depending on the author's intent. From what I have seen in most business writing, and especially in program documentation and ads, P&S is sorely needed in the microcomputer community.

Unfinished Business

Let's raise our glasses in a toast to almost completed software, then let's beg manufacturers to put in the extra effort it takes to drive their products to completion.

Office Writer is a $325 word processor (I evaluated version 1.5, a "preliminary test" release). Its packaging and support are amazingly well-executed. For instance, the Office Solutions folks invite you to call them, even to complain; and, a one-day training session is available from the company (I presume only to firms, and not to individuals). OW is supplied with a good function-key template and even a word processing ruler to check pitch and the like.

But does it do anything? It does, but leaves out some features and angers serious users. For instance, while merge capabilities (form letter writing) and a wide range of print controls (underline, bold, compressed, wide type) are included, cursor commands don't allow word, sentence or paragraph movement through the text. Certain functions, like large cursor moves, take a little too long for my liking, making Office Writer act

Address correspondence to Thomas V. Bonoma, 45 Drum Hill Road, Concord, MA 01742.

more like a compiled Basic program than a machine language one. There are other strange things here as well. Like Multimate, pagination is not automated in OW—you have to end pages or run your file through a utility to do it for you (a bother). Top and bottom page margins are not setable, except as the lines on a page are increased or decreased.

To the contrary, much of OW shows high professionalism in design and operation. The program uses a simple five-function menu for all of its actions. It's fully integrated with the PC function keys and it has document summary screens to help organize your files. In operation, there's little screen flutter, even on a color monitor (OW runs only in black and white). A relatively complete, although somewhat tedious, mail merge facility is provided standard with the program, and a good block extract facility is included. Functions used frequently, like text deletions, have been thought through carefully so that you can just point the cursor at the given range and then execute the function. Strangely, this ability works for only forward deletions—a flaw. There is, however, no "undo" key to remedy mistakes. The manual is a marvel of clarity.

The OW people will provide free upgrading to version 2.0 if you buy their product now. I like OW, but it has a way to go before I'll quit using WordStar for it; I'd wait for revision 2 on this one.

FormManager (FM) is another product that is only 80 percent complete. FM combines data entry, management, processing and forms design in one integrated package. Essentially, all you have to do is "paint" the screen with boxes and labels (32,767 records per form, ten forms per record), define the data categories and start entering data. FM is sophisticated in terms of capability; for instance, default values, minima and maxima and data types (e.g., telephone numbers) are all supported by the program. The program's calculated field abilities are awesome and incorporate a dBaseII-like programming language that permits use of 26 general math functions and even "if" programming and loops. Best of all, FM supports column vectors; that is, you can define and operate on columns of numbers (like different orders from the same customer), updating their total, all at once. I've only seen this capability in VersaForm. The program is fast (B-tree sorting and multiple indexing are supported), has on-line help, a tutorial disk, an Undo function and the ability to restructure data files once created.

So where are the raves? Well, where's the report feature? Just what good is data entered into a stupid machine if you can't manipulate it and get it back out? FM's print function allows you to format and select fields for reports but not values within fields! For instance, you can easily search for records containing particular strings, and FM will display them on the screen or printer. What you can't do is request a report for all accounts overdue by more than 20 days (or any other contingency); this is a major flaw in a program designed to aid information management. Also, you can't transfer existing data files (say from VisiCalc or WordStar) to the program (though the company hopes to have both these options available in the future as extra-cost items). A database manager you can't get data into or out of in the way you want is not a database manager at all. No amount of on-board calculators, autotime and date features or inverse video can substitute for that. I'd like to see both these companies push their development efforts toward complete user packages.

I don't find dBase easy to use, but I can get the information I've put in back out, my way.

Sleepers

A sleeper is a program that, well . . . is a sleeper; you might not buy it in a store because you've been burned before, but let it operate a little bit and wow! There are three this month—Friend, a report generator for dBaseII, Bluebush Chess and Type Faces from Alpha Software.

Friend clearly gets the sleeper-of-the-year award. Its name is strange; it's produced by Friends Software and packaged in one of those oversized ring binders with the tiny type that lets you know in advance that you're in trouble; the press kit sent to me was a bunch of computer output with things circled that I couldn't understand. However, somehow on its

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way to the wastebasket the disk wound up in Drive A. I'm here to tell you that these people may not be able to package, but they sure can write software.

Friend tabulates your dBase file in any way you'd like, with any kind of output you'd like. Do you have a file containing fields of marital status by salary? Tell Friend to get you single and married categories by 0–$10,000, $10,001–$20,000 and so on, and to count the percentages of people falling in each category by row, column and total. Similar things can be done to construct quarterly reports; Friend is as friendly with dates as it is numbers and requires only an English command to do it (e.g., tabulate payee (10) by month<1,3–5,7>).

The User's Friend

Friend also does totalling, subtotalling, sorting and other usual extractions that you'd expect to be able to get with dBase's normal report command. The reason is that Friend isn't limited to dBase files, but it will and can handle any ASCII-type file for its application. So, if I weren't being so critical about Form Manager, I could have used Friend as the report generator for this program and been just fine. Both variable and fixed-length records are accommodated by the program, all commands are English-like and the program seems relatively immune to operator error. Despite the print job, the manual is well-done. If you have a reporting need, take a look at this package.

Bluebush Chess—oh no, another stupid game? Well, no. Like CopyIIPC, a disk utility I reported on several months ago, Bluebush Chess is about as close to perfection as a program for the PC can come.

I don't know whether you play chess, but if you do, the program is a marvel of quick, reliable operation in color or black and white. It has only an index-card-sized set of instructions to deal with, runs flawlessly and even includes a plastic disk holder that will accommodate ten disks.

The program has options for postal chess, playing against the computer and for presetting the board for your own openings. It doesn't beep at you like some silly doorbell, and it does a reliable job.

Type Faces, from Alpha Software, is one of those programs that makes you ask: "Did I really pay that much for just a printing program?" But, then you run it and see that your Epson, IBM, Prism or other dot-matrix printer can be turned into a multiple-font presentation device for slides or other materials. Type Faces itself not only takes WordStar files, but gives you its own range of dot commands to allow justification, filing, needed page breaks and the like so that you can write a letter in fancy script if need be, all inside of Type Faces.

Now, you should plan for a short letter, since TF has only two sizes of characters, both big. But, since the program also automatically paginates (and numbers and has heading and footing ability), this size limitation isn't as bad as it first looks. The manual is short, sweet and clear, a departure from much software documentation. And, if that isn't enough, Alpha throws in a big plus—an audio training tape to teach you how to use the program. A lot of thought has gone into this program, and it's both a mini word processor in multiple fonts and a reason to put off buying that plotter for another year. Some sample output from Type Faces is shown in Fig. 1.

Data Base Manager II

While I'm on Alpha Software, let me tell you about its Data Base Manager II (DBMSII), another good program and no sleeper. DBMSII is a clear and relatively simple-to-use DBMS program that is supported with a marvelous manual and an audio training tape. It is capable of "talking with" VisiCalc, 1-2-3, Multiplan and other spreadsheets and with WordStar and other word processors. That means you only have to enter data once in order to build an integrated spreadsheet, graphics and word processing system that should stand you in good stead for a long time to come.

The program allows for wild card searches, quick sorts, restructuring of the database, report generation, form letter generation and other features than can be implemented on a wide variety of printers and with either DOS 1.1 or 2.0.

There is no physical limitation to the length of a data file, except hard disk size, though there are restrictions on field sizes, labels and the like. For instance, each field can be only 60 characters in length and field names can contain up to just ten characters. Forty fields can be entered per record; this is another limitation for complicated applications.

But, if you can live with those rules, you'll find it a fine, well-implemented DBMS. Can't spell very well? That's OK, DBMSII supports a "sounds-like" search facility that retrieves Bauer and Bower. And, without WordStar or another word processor, DBMSII lets you generate mail-merged form letters with keyboard input and file input at print time. There is also a good copy/reconfigure utility option to change the database when you decide there aren't enough fields. And, like some other quality DBMS packages, DBMSII has a set of suggested applications in the manual, so you can be up and running quickly.

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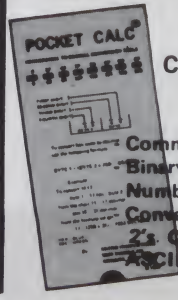
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All in all, this DBMS lives up to its subtitle of The Integrator. The photo shows the product.

On the negative side, the product, as a compiled Basic program, often makes you wait for disk accesses while new modules are loaded. And the program's innovative file importation routines (for communication with Mail/Merge files, for instance), have less intelligence and require more manual labor than they should. Still, DBMSII does communicate with spreadsheets, word processors and other programs.

More Integration

Say you're already hooked on PeachText 5000 and its good List Manager program. You're not going to want to learn another set of commands; you like the thesaurus and you still would like to be able to interact with other programs? Let's make it really tough and demand graphics, too. Well, fear not. Peachtree has responded with two packages that can stand alone, but they are much better employed as extensions to the PeachText 5000 package: Access Pak and Business Graphics.

Access Pak is a program, or rather a set of programs, to convert files from VisiCalc to PeachCalc and from WordStar or EasyWriter to PeachText. In addition, AP serves as a bridge between the PeachPak 8 accounting system's output and the PeachText 5000 modules, including PeachCalc, PeachText and List Manager.

Essentially, AP integrates accounting, word processing, list management and calc-ing applications to let you write a form letter to all accounts with outstanding balances of $300 or more and print the mailing labels through List Manager. But I suspect the WordStar and other "foreign" conversion files will interest

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Fig. 1. An example of Type Faces output.

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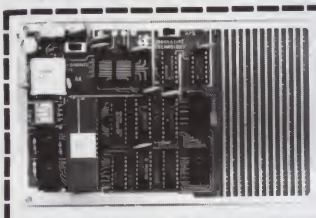
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The APB is an excellent **educational aid** which allows for evaluation and familiarization of 6801 family members. If is great for **prototype development.** Since the "nuts and bolts" are already in place, the designer need only add the necessary interface circuits for a particular application. It can also be used as a simple cost-effective **dedicated controller** for those limited quantity applications.

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Photo 1. The Data Base Manager II package.

you the most. Outside of the fact that communication is one-way (from WordStar, for instance) to the Peachtree products, which shows (a) a lack of sense and (b) awesome arrogance, these conversions work, easily and quickly. They are well-documented and well-executed. Best of all, you can get them below cost with a coupon that is included in the PeachText package.

Business Graphics is a strange program. It reads SuperCalc (whoops! I mean PeachCalc) files well and has a wide variety of graph types, including line, bar, area, pie, critical path, histogram, scatter chart and even word charts. The program has on-line help (a major plus) and good documentation. Yet, much of the time the program stumbles over its own code. For instance, you have to go back and forth from menu to menu just to get a graph displayed. However, the options on lots of the choices on those menus, such as text font, size and color, are nonintuitive and hard to remember without the manual in front of you. Also, strange programming restrictions, like having to create two files (one of labels and one of data) for each graph, impede use.

In many ways, Business Graphics is more flexible than many graphing packages on the market today. It is also in

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What About Me?

But, what's in it for you if you're a convinced, confirmed or constant VisiCalc user? Well, how about two products, one from VisiCorp and one not from VisiCorp?

VisiTrend/Plot is a business graphics forecasting and statistical package that offers flexibility with some heavy costs.

The program is made up of three modules: a main one, which handles data loading, saving and other housekeeping; a plot subprogram, which communicates the data pictorially with six basic kinds of graphics formats; and a trend subprogram, which handles the computation of moving averages, data smoothing, percent change combinations, lead/lag measures and cumulative totals. Trend also handles regression, t-test computations, F-distribution estimation and Durbin-Watson statistics as well as the univariate computations (mean, variance, correlation and so on) and trend-line analysis.

If the statistical description above was confusing to you, don't worry. Many users have no use for Trend's advanced computations and will find the program unnecessarily sophisticated for what they want to do vis-a-vis analysis. However, in many ways the plot subroutines are too unsophisticated for much of what a manager might want to do with words and data. There is, for instance, no text plotting facility in VT/P. This is a major flaw in what claims to be a business graphics package. While you can do line, bar, area, x,y, pie and hi-lo-close charts with the system, as well as combinations of these, all graphics are in black and white on an IBM color system, only a narrow range of NEC and IBM/Epson printers are supported and no plotter support is included.

VisiTrend/Plot: So Simple . . .

This puts VT/P squarely in the camp of analytic graphics packages rather than presentation-quality ones. Like all of VisiCorp's software, this package is well-documented and has a menu structure so simple it's hard to go wrong. But that same structure gets tedious as you get more familiar with the program, because you get impatient with having to choose things all the time.

In summary, if you want to know what your data means and have the skills to run/interpret the sophisticated trend analyses provided, this package is one of the most complete on the market. If you want to show your findings in a presentation, you might be better off with another package.

Viz-a-Merge works with both VisiCalc and the Lotus 1-2-3 package. The concept of the program is that it allows you to "cut and paste" your "flat files" (i.e., two-dimensional data tables constructed with either VC or 1-2-3) into three-dimensional solids.

To be a little less planar, you can, for instance, "cut" year-end totals from budget projections at the department, division and total company levels and then "paste" them together for an overall company analysis. Or, you can have a payroll model containing a year's activity for each person, then use Viz-a-Merge to create a payroll register by person and pay.

The program manual includes system layout forms so that you can plan your merges, and the program itself follows these forms with a series of questions that makes the merging easy. You can even save the process of merging some spreadsheet files for future reference, so that if you'd like to repeat it, it can be done automatically.

The program has a simple four-function menu from which all its merge-process, merging and printing abilities are called. The manual is simple but complete. It even contains filled-in forms to show you how to do the 3-D merges. If you find yourself going back and forth

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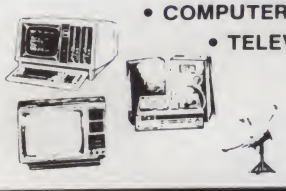
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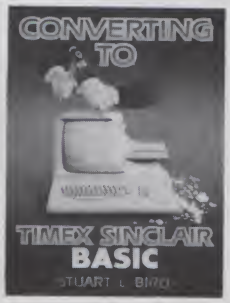
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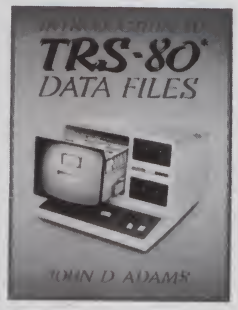
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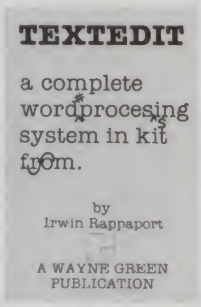
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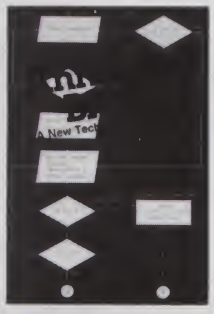
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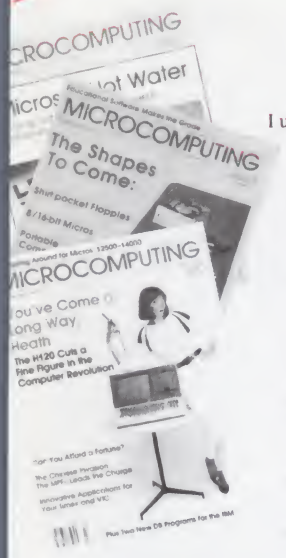
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Venture is a partially preformatted financial planning language that confronts you with only a limited need for inputs. In return it gives you ten different kinds of reports of managerial value. These include income statements, percent of sales statements, detailed income statements, cash flow and return on assets, net present value/DCF, an NPV/DCF sensitivity analysis, long-term asset/depreciation analysis, working capital, balance sheet preparation and a full slate of financial ratios.

The Venture database is a shell you complete. While you have to have variable costs as part of the database, Venture allows you to define custom accounts or categories of variable costs to fit your business. Similar flexibility is shown in all the other categories. Similarly, the program isn't picky about how you enter data, but will take it as absolute, projected or combination absolute/projected data. Best of all, "what if" analyses are as easy as entering a new value and rerunning the reports in question; the program also has extensive online help.

If you have an 8087 chip in your computer, the Venture program will support it; however, except for one report (sensitivity analysis), the program runs more than enough without the 8087. The Weiss people, especially George Weiss, have extensive experience in producing minicomputer financial modeling systems and have translated their expertise to the PC. They have also shown Cadillac user support and quick responsiveness to queries and bugs. Since I've had the package, I've seen no fewer than three free enhancement releases from the Weiss people; all are designed to catch small computation errors that I couldn't even find when they were pointed out to me! This is a package I strongly recommend to operating managers.

You've seen the ads. "I bought this computer package and saved my business $1,000,000!" Well, Decision~Analyst is the package, and it may well be worth its purchase price when you're trying to resolve complex decisions. The program is a structured decision-making aid that forces you to:

(1) Define your problem or opportunity.

(2) State the purpose of the decision you want to make in action terms.

(3) Define which criteria the decision should satisfy, including specification as to whether the criterion is one you'd *want* to have or *must* have.

The program will then print your criteria sorted by value and ask for a definition of the decision alternatives facing you.

You must then define your alternatives in terms of the criteria you specified as essential. The program weighs each alternative by the criteria and shows you a listing of how each one came out. But that's not all; the adverse consequences of each alternative are taken into consideration before you draw your final conclusions and make a choice.

The power of this program isn't in its computational abilities, which are fairly simple subjectively expected value criterion weightings against alternatives, but is in the rigor it imposes on the decision-making process and on the written record it produces on the thinking, weighing and evaluation process.

Indeed, a complete written report, including text, weightings and conclusions, is generated for you by the program; this is one of its most valuable features. The program has good text-editing capabilities, an exceptionally clear structure and manual and good error messages. It even warns you if you're getting close to running out of memory before something bad happens.

There is on-line help with on-line examples of how to answer all of D~A's prompts as well. This is a marvelous program for simplifying those complicated decisions we all face with multiple alternatives and multiple criteria, and if you use it, you just *might* "save yourself from disaster" with Decision~Analyst.

A Hint for the Puzzle And a Word of Thanks

Last month I told you about a puzzle in which pfs:Report bombs after you get a new TecMar board with RAMdisk and autodate/time facility. As this is being written, I've had no correct answers from readers, so I will extend the contest another month to see what happens. Here is a hint to help you out with the solution—it's very high up here.

Before I end this month's column, let me thank all of you for requesting Desktop, the desk organizer. The program, a Freeware one, is being distributed faster than I expected, which is gratifying. Copies can still be obtained by sending two preformatted, double-sided disks plus

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Baby Blue board	CALL	CALL
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a prepaid mailer, or by sending a $20 donation to Microcomputer Management, 45 Drum Hill Road, Concord, MA 01742. Revision 2 of Desktop is being completed; watch this space for more information.

No program this month; your letters and these software packages are keeping me too busy to write one!

How about sending your best, short effort to me! If it's good and of general interest, we'll publish it here in a future column.□

The "Big Blue" Black Book

Prices and Addresses of This Month's Featured Products and Companies

Access Pak ($525)
Peachtree Software Corp.
3445 Peachtree Road, N.E.
Atlanta, GA 30326

Bluebush Chess ($49.95)
Bluebush, Inc.
PO Box 3585
Santa Clara, CA 95051

Business Graphics ($295)
Peachtree Software, Inc.
3445 Peachtree Road
Atlanta, GA 30326

Data Base Manager II ($295)
Alpha Software Corp.
12 New England Executive Park
Burlington, MA 01803

Decision∿Analyst ($295)
Executive Software, Inc.
2 North State St.
Dover, DE 19901

Friend:Report Generator ($295)
Friends Software Co.
Tioga Building, Suite 440, Box 527
Berkeley, CA 94701-0527

Form Manager ($195)
Bit Software, Inc.
Box 619
Milpitas, CA 95035

I.B. Magazette ($80/six issues)
1306 Petroleum Tower
Shreveport, LA 71101

Mentor ($99/six issues)
1362 Pacific Ave.
Santa Cruz, CA 95060

Office Writer ($325)
Office Solutions, Inc.
PO Box 5146
Madison, WI 53705

PC Magazine ($29.95 per issue)
CN 1916
Morristown, NJ 07960

Punctuation & Style ($125)
Oasis Systems
2765 Reynard Way
San Diego, CA 92103

ReadiScope ($295)
ReadiWare Systems, Inc.
PO Box 680
W. Reading, CT 06896

Type Faces ($125)
Alpha Software Corp.
12 New England Executive Park
Burlington, MA 01803

Venture ($495)
Weiss Associates
127 Michael Drive
Red Bank, NJ 07701

VisTrend/Plot ($300)
VisiCorp
2895 Zanker Road
San Jose, CA 95134

Viz-a-Merge ($139.95)
Abacus Associates
6565 W. Loop S., Suite 220
Bellaire, TX 77401



SOFTWARE DESCRIPTIONS

TPM (TPM I) - $80 A Z80 only operating system which is capable of running CP/M programs. Includes many features not found in CP/M such as independent disk directory partitioning for up to 255 user partitions, space, time and version commands, date and time, create FCB, chain program, direct disk I/O, abbreviated commands and more! Available for North Star (either single or double density), TRS—80 Model I (offset 4200H) or II, Versafloppy I, or Tarbell I.

TPM-II - $125 An expanded version of TPM which is fully CP/M 2.2 compatible but still retains the extra features our customers have come to depend on. This version is super FAST. Extended density capability allows over 600K per side on an 8" disk. Available preconfigured for Versafloppy II (8" or 5"), Epson QX-10, Osborne II or TRS-80 Model II.

CONFIGURATOR I

This package provides all the necessary programs for customizing TPM for a floppy controller which we do not support. We suggest ordering this on single density (8SD).
Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE ($FREE), MACRO II ($100), LINKER ($80), DEBUG I ($80), QED ($150), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$815 Value **NOW $250**

CONFIGURATOR II

Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE ($FREE), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QSAL ($200), QED ($150), ZTEL ($80), TOP II ($100), BUSINESS BASIC ($200) and MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1485 Value **NOW $400**

MODEL I PROGRAMMER

This package is only for the TRS-80 Model I. Note: These are the ONLY CDL programs available for the Model I. It includes: TPM I ($80), BUSINESS BASIC ($200), MACRO I ($80), DEBUG I ($80), ZDDT ($40), ZTEL ($80), TOP I ($80) and MODEM ($40)
$680 Value **NOW $175**

MODEL II PROGRAMMER

This package is only for the TRS-80 Model II. It includes: TPM-II ($125), BUSINESS BASIC ($200), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QED ($150), ZTEL ($80), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM ($40), MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1445 Value **NOW $375**

BASIC I - $50, a 12K+ basic interpreter with 7 digit precision.

BASIC II - $100. A 12 digit precision version of Basic I.

BUSINESS BASIC - $200. A full disk extended basic with random or sequential disk file handling and 12 digit precision (even for TRIG functions). Also includes PRIVACY command to protect source code, fixed and variable record lengths, simultaneous access to multiple disk files, global editing, and more!

ACCOUNTING PACKAGE - $300. Written in Business Basic. Includes General Ledger, Accounts Receivable/Payable, and Payroll. Set up for Hazeltine 1500 terminal. Minor modifications needed for other terminals. Provided in unprotected source form.

MACRO I - $80. A Z80/8080 assembler which uses CDL/TDL mnemonics. Handles MACROs and generates relocateable code. Includes 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical ops, local and global symbols, linkable module generation, and more!

MACRO II - $100. An improved version of Macro I with expanded linking capabilities and more listing options. Also internal code has been greatly improved for faster more reliable operation.

MACRO III - $150. An enchanced version of Macro II. Internal buffers have been increased to achieve a significant improvement in speed of assembly. Additional features include line numbers, cross reference, compressed PRN files, form feeds, page parity, additional pseudo-ops, internal setting of time and date, and expanded assembly-time data entry.

DEVELOPER I

Includes: MACRO I ($80), DEBUG I ($80), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$440 Value **NOW $150**

DEVELOPER II

Includes: MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), BUSINESS BASIC ($200), QED ($150), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM SOURCE ($40), ZTEL ($80), and DISASSEMBLER ($80).
$1280 Value **NOW $350**

DEVELOPER III

Includes: QSAL ($200), QED ($150), BUSINESS BASIC ($200), ZTEL ($80) and TOP II ($100)
$730 Value **NOW $300**

COMBO

Includes: DEVELOPER II ($1280), ACCOUNTING PACKAGE ($300), QSAL ($200) and 6502X ($150)
$1930 Value **NOW $500**

LINKER - $80. A linking loader for handling the linkable modules created by the above assemblers.

DEBUG I - $80. A tool for debugging Z80 or 8080 code. Disassembles to CDL/TDL mnemonics compatible with above assemblers. Traces code even through ROM. Commands include Calculate, Display, Examine, Fill, Goto, List, Mode, Open File, Put, Set Wait, Trace, and Search.

DEBUG II - $100. A superset of Debug I. Adds Instruction Interpreter, Radix change, Set Trap/Conditional display, Trace options, and Zap FCB.

6502X - $150. A 6502 cross assembler. Runs on the Z80 but assembles 6502 instructions into 6502 object code! Similar features as our Macro assemblers.

QSAL - $200. A SUPER FAST Z80 assembler. Up to 10 times faster than conventional assemblers. Directly generates code into memory in one pass but also to offset for execution in its own memory space. Pascal like structures: repeat...until, if...then...else, while...do, begin...end, case of. Multiple statements per line, special register handling expressions, long symbol names, auto and modular assembly, and more! This one uses ZILOG Mnemonics.

QED - $150. A screen editor which is both FAST and easy to learn. Commands include block delete, copy, and move to a named file or within text, repeat previous command, change, locate, find at start of line, and numerous cursor and window movement functions. Works with any CRT having clear screen, addressable cursor, clear to end of line, clear to end of screen, and 80X24.

ZTEL - $80. An extensive text editing language and editor modelled after DEC's TECO.

ZEDIT - $50. A mini text editor. Character/line oriented. Works well with hardcopy terminals and is easy to use. Includes macro command capability.

TOP I - $80. A Text Output Processor for formatting manuals, documents, etc. Interprets commands which are entered into the text by an editor. Commands include justify, page number, heading, subheading, centering, and more.

TOP II - $100. A superset of TOP I. Adds: embedded control characters in the file, page at a time printing, selected portion printing, include/merge files, form feed/CRLF option for paging, instant start up, and final page ejection.

ZDDT - $40. This is the disk version of our famous Zapple monitor. It will also load hex and relocatable files.

ZAPPLE SOURCE - $80. This is the source to the SMB ROM version of our famous Zapple monitor. It can be used to create your own custom version or as an example of the features of our assemblers. Must be assembled using one of our assemblers.

MODEM - A communication program for file transfer between systems or using a system as a terminal. Based on the user group version but modified to work with our SMB board or TRS-80 Models I or II. You must specify which version you want.

MODEM SOURCE - $40. For making your own custom version. Requires one of our Macro Assemblers.

DISASSEMBLER - $80. Does bulk disassembly of object files creating source files which can be assembled by one of our assemblers.

HARDWARE

S-100 — SMB II Bare Board $50. "System Monitor Board" for S-100 systems. 2 serial ports, 2 parallel ports, cassette interface, 4K memory (ROM: 2708 EPROM, 2114 RAM), and power on jump. When used with Zapple ROM below, it makes putting a S-100 system together a snap.
Zapple ROM $35. Properly initializes SMB I/II hardware, provides a powerful debug monitor.

IBM PC — Big Blue Z80 board $595. Add Z80 capability to your IBM Personal Computer. Runs CP/M programs but does not require CP/M or TPM. Complete with Z80 CPU, 64K add on memory, serial port, parallel port, time and date clock with battery backup, hard disk interface, and software to attach to PC DOS and transfer programs. Mfr'd by QCS.
50% Discount on all CDL software ordered at the same time as a Big Blue (and for the Big Blue).

APPLE II — Chairman Z80 $345. Add Z80 capability to your Apple II/II Plus computer. Runs CP/M programs with our more powerful TPM. Includes 64K memory add on (unlike the competition this is also useable by the 6502/DOS as well as the Z80). TPM, QSAL assembler, QED Screen Editor, and Business Basic. Mfr'd by AMT Research.
Apple Special $175. Buy the Apple Z80 Developer at the same time as the "Chairman" and pay only $175 instead of $325.

APPLE Z80 DEVELOPER

Includes: 6502X ($150), MACRO II ($100), MACRO III ($150), QSAL ($200), QED ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), ZDDT ($40) and BUSINESS BASIC ($200)
VALUE: $1250 **NOW $325**
$175 when purchased with AMT "Chairman" Board

DISK FORMATS

When ordering software specify which disk format you would like.

CODE	DESCRIPTION
8SD	8" IBM 3740 Single Density (128 bytes/26 sectors/77 tracks)
8DD	8" Double Density (256 bytes/26 sectors/77 tracks)
8XD	8" CDL Extended Density (1024 bytes/8 sector/77 traceks 616K)
5SD	5.25" Single Density (TRS80 Model I, Versafloppy I, Tarbell I)
5EP	5.25" Epson Double Density
5PC	5.25" IBM PC Double Density
5XE	5.25" Xerox 820 Single Density
5OS	5.25" Osborne Single Density
5ZA	5.25" Z80 Apple (Softcard compatible)

TPM INFO When ordering TPM I or II, in addition to Disk Format, please specify one of the following codes:

	CODE	DESCRIPTION
TPM I:	NSSD/H	North Star Single Density for Horizon I/O
	NSSD/Z	North Star Single Density for Zapple I/O
	NSDD/H	North Star Double Density for Horizon I/O
	NSDD/Z	North Star Double Density for Zapple I/O
	TRS80-I	TRS-80 Model I (4200H Offset)
	TRS80II	TRS-80 Model II
	VI8	Versafloppy I 8"
	VI5	Versafloppy I 5.25"
TPM-II:	VII8	Versafloppy II 8" (XD)
	VII5	Versafloppy II 5.25"
	TRS80II	TRS-80 Model II (XD)

ORDERING INFORMATION:

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OEMS:

Many CDL products are available for licensing to OEM's. Write to Carl Galletti with your requirements.

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For Phone Orders ONLY Call Toll Free...
1-(800) 458-3491 (Except Pa.)
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Computer Design Labs

342 Columbus Avenue/Trenton, NJ 08629

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By Jim Heid

Jr Speaks For Itself

The Unveiling: No Hype, No Gimmicks, No Eggs

On Product Introductions and PCjr

IBM's introduction of PCjr last November 1 was a refreshing change from most new-product intros.

In these days of intense competition and mammoth promotional budgets, new products from large firms usually are introduced in multimedia extravaganzas that look like a cross between a computer club meeting and a Mary Kay Cosmetics convention. Slide shows, presidents behind podiums, free buttons and four-course breakfasts in posh hotels—all of these gimmicks are used to convince the world that *this* product is, to quote a recent press release, "truly innovative, flexible and significant."

Yes, personal computers are great for the hotel and catering industries.

Ah, but IBM did it right. The largest computer company in the world didn't hire a Dixieland band or rent a velvety ballroom to introduce Junior. Without fireworks or fanfares, PCjr was unveiled in the Science and Technology Gallery of the IBM Building in midtown Manhattan. (That explains why IBM didn't have to rent a room.)

There was no podium, no slide show, no buttons, no promoter's gimmicks at all—just Junior.

Actually, there were several Juniors. Each was set up on its own table, and each was running a different software package. An IBM representative stood at each table, ready to answer questions and demonstrate the system.

At one table, an engineer answered technical questions and explained some of the internal details of the two coverless Juniors in front of him. At another table, HomeWord, an icon-oriented word processor from Sierra On-Line, was on display (see p. 40). Also demonstrated were a telecommunications package from Microcom called Personal Communications Manager, a personal finances manager called Home Budget, *jr*, and numerous games.

The whole production was set up to let people touch and use the new machine. If you wanted to talk to someone about it, they were there. But no one shoved hype disguised as eggs Benedict at you. Junior spoke for itself.

Is It a Winner?

We told you something of IBM's new machine in last month's "Overview" column. For specifications, see "A Capsule Look at the IBM PCjr" on this page; the photo captions describe some of its details.

From a technical standpoint, PCjr isn't a revolutionary machine. It compares

A Capsule Look at the IBM PCjr

Manufacturer
IBM Corp., PO Box 1328, Boca Raton, FL 33444.

Price
$669 for entry model (64K, no disk drive); $1269 for expanded model (128K, one disk drive).

System Unit Features
Intel 8088 microprocessor running at 4.77 MHz; PC DOS 2.1 operating system; 64K ROM, containing Cassette Basic, system diagnostics and a keyboard tutorial; 64K RAM expandable to 128K. Input/output features: one serial port, two expansion slots, two cartridge slots, ports for light pen, joysticks cassette and video monitor.
Size: 13.9 inches wide, 11.4 inches deep, 3.8 inches high; six pounds without disk drive, nine pounds with.

Keyboard
Wireless infrared link, approximately 20-foot line-of-sight range; also can use optional six-foot connecting cable (recommended where more than one computer is being used). Sixty-two keys, including function-control key and cursor keys; tilts at 5- or 12-degree slope; uses four AA batteries.
Size: 13.45 inches long, 6.61 inches deep, 1.02 inches high; 22 ounces without batteries, 25 with.

Disk Drive
Half-height 5¼-inch drive, 360K storage on double-sided disks, 512 bytes per sector, nine sectors per track, 48 tracks per inch; 6 ms track-to-track access time; 250K bits-per-second transfer rate.

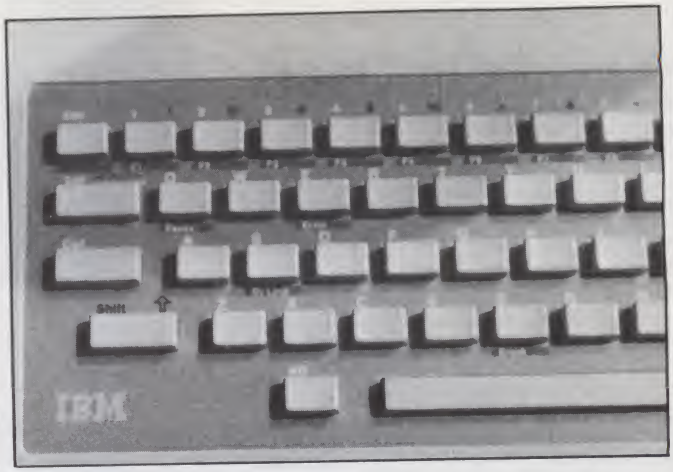
Memory and Display Expansion
User-installable; plugs into 44-pin connector on system board; adds 64K memory and 80-column display capability.

Internal Modem
User-installable; plugs into system board; autodial, either touch-tone or rotary pulse; auto/manual answer and originate; user-programmable using ASCII characters; 300 bps data rate; built-in error detection and diagnostics.

Software Available
Includes EasyWriter, HomeWord, pfs: File, pfs:Report, Time Manager, Multiplan 1.10, VisiCalc 1.20, Logo, Disk Librarian, Dow Jones Reporter, telecommunications package.



A PCjr system consisting of keyboard, system unit with disk drive and monochrome monitor. Note the Selectric-style return key.



A close-up of the keyboard. The keys have a stiffer feel than the PC's, and they don't "click" when pressed. The key legends aren't printed on the keytops—they're printed above and below the keys.

more to the Commodore-64, the Atari 800/1200 and the late Texas Instruments 99/4A than to anything else. It does, however, have a more powerful microprocessor, more memory, a wireless keyboard and limited compatibility with the PC—all features the others lack.

Is It Worth It?

With a list price of $669, PCjr buyers will be paying substantially more for a home computer than Commodore, Atari or TI buyers. Besides what's under the hood, what will they be getting that the others won't?

Guidance. The three computers just mentioned are sold mainly by mass merchandisers who don't have computer-knowledgeable salespeople to guide customers into making informed purchases. PCjr will be sold through IBM dealers, so prospective buyers will be able to ask questions and, hopefully, get intelligent answers.

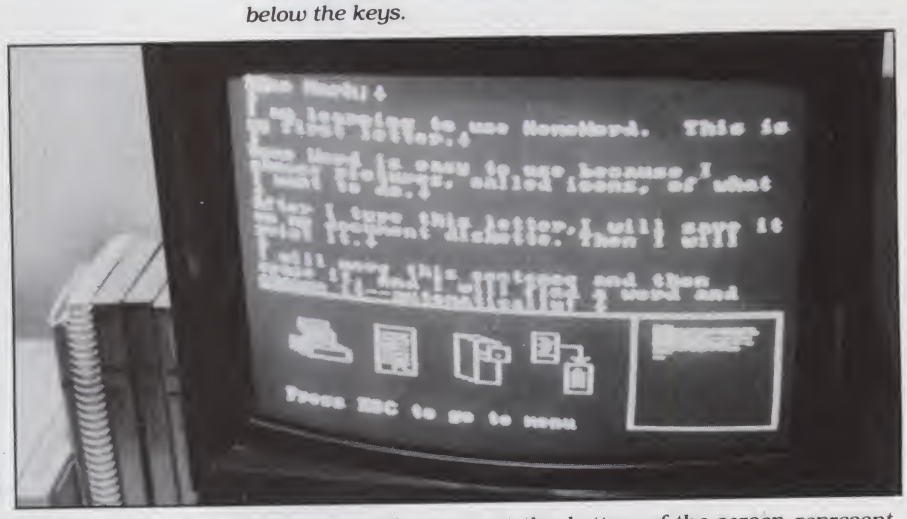
They'll also be getting products from manufacturers other than IBM, or third-party support. Most home computers have some third-party products available, but PCjr will no doubt create an industry just like the PC did.

Expect most companies currently making products for the PC to come out with products for PCjr. Incompatible software will be converted. More new software will be written that will run on both machines. Programs that exploit the power of the 8088 chip will let PCjr leave the others fumbling for their joysticks.

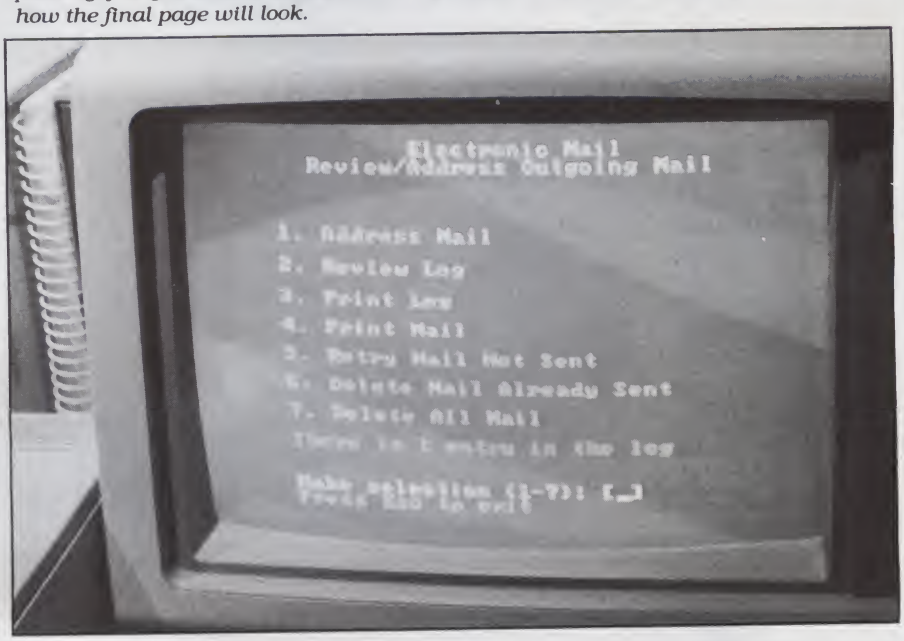
If that's not enough, consider the clones—expect to see PCjr-compatibles soon, selling for less than the real thing.

PCjr buyers will be paying more for their machines. But they'll be getting more—better support, better quality and third-party support that can't even be imagined yet.

Taken in that light, maybe PCjr *is* a revolutionary machine.



The HomeWord word processor. The icons at the bottom of the screen represent printing, filing and editing functions. The box at the lower right of the screen shows how the final page will look.



The Personal Communications Manager. This telecommunications package lets you send and receive electronic mail and features one-keystroke access of information services when used with an autodial modem.

IBM PCjr Users: HomeWord Bound?

A Look at Sierra's Easy-to-Use Software for PCjr, Apple, C-64 and Atari Owners

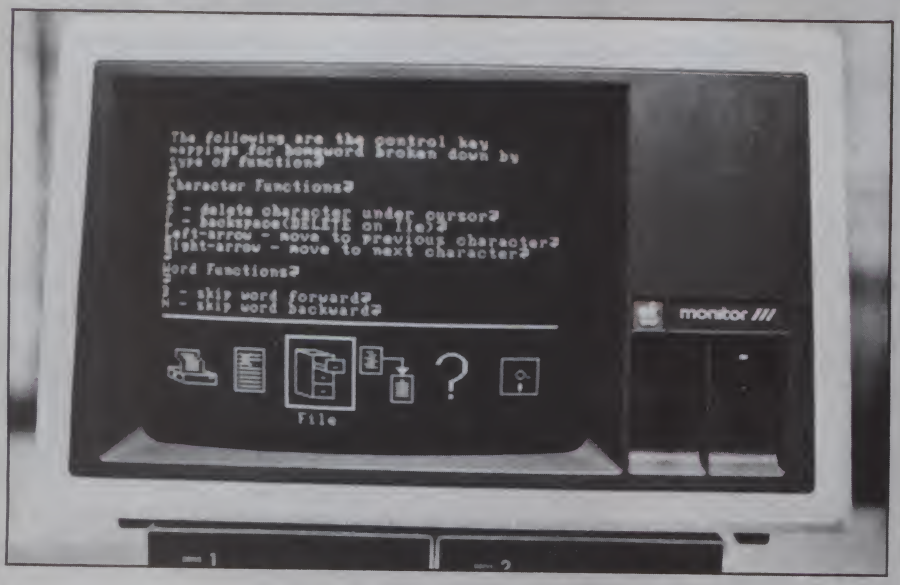
Thirty minutes ago I unwrapped a package containing HomeWord, a new word processing system from Sierra On-line. Now I'm writing this review on it—utilizing every option necessary for the writing, editing, filing and printing the text.

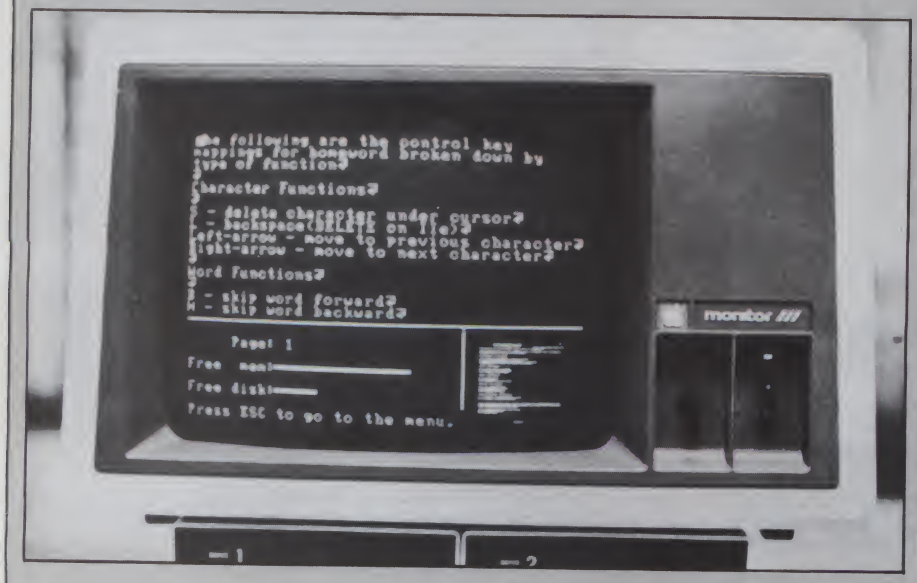
PCjr Program Made For Other Machines

This new entry is the program offered with the IBM PCjr. It should come as relief to owners of other machines—the Apple II, II Plus, IIe, Commodore-64 and Atari—that they need not purchase a PCjr to enjoy one of the easiest to use word processors for the home market.

HomeWord is significant because it is the first software specifically designed for the home computer that uses icons to guide you through the program. It's similar to the icon concept made popular by the Apple Lisa last year.

HomeWord comes with a 25-minute audio cassette that guides the first-time user through the rudiments of turning on a computer and handling the disks. The narrator then demonstrates cursor moves and editing techniques. By the end of the first 15 minutes or so, anyone will be facile with HomeWord.





Icon See the Difference

Upon booting the program disk, you're greeted by a screen horizontally divided between work space and icon space. The "icon cursor" can then be positioned over any one of six icons along the bottom of the screen and an option chosen.

To begin, you select the file cabinet icon (it's labeled as well as depicted). There is a sub-menu for filing that gives four further choices.

To begin a new document, you only have to assign a name before being presented with the typing screen. The Apple version operates in the high-resolution mode, providing very readable type in true upper/lowercase (with the shift mode installed) without the necessity for any special hardware. The lower left screen graphically displays the amount of free disk and free memory space.

One of the most impressive and useful features of the edit mode is the page sketch in the lower right. As a document is typed, this sketch fills in a miniature page showing the relative spacing of type on the page. If the margins are reset, the sketch, too, is reset to show how the document will look on paper. This interactive icon can save many a sheet of paper!

Each of the other components of HomeWord are just as logical (and fun) to use.

Prime-Time Processor

This program is perfect for occasional home word processing. If not used for some time, relearning the program shouldn't take more than a few minutes. This is a program that the entire family could easily use.

Perhaps it's the harbinger of a new generation of simple, yet flexible, programs for the home market.

HomeWord is available for the Apple, Commodore and Atari. At $49.95, it's reasonably priced. Unfortunately, it is copy-protected with a hefty $10 fee required for a back-up copy (that's 20 percent of the purchase price!)

HomeWord is made by Sierra On-Line, Coarsegold, CA 93614.

K.T.

Keep an Eye on Your Memory

These two short Timex/Sinclair monitor programs take the tedium out of examining memory locations. So sit back and leave the peeking and poking to us.

By Edward Rager

A memory monitor for your Timex/Sinclair 1000 is no big thing if all you want to do is examine memory locations or change their values. You can do that yourself using Peek and Poke statements. However, that can become tedious if you want to look at more than a few locations.

The program in Listing 1 does the peeking and poking for you. All you have to do is tell it where to start. All values entered and displayed are in decimal.

When you run the program, it asks for the address you want to examine. Type the value (in decimal) and press Enter. The display shows the location, the value stored at that location and the character or keyword represented by that value. Typing F and Enter displays the next location. To display the previous location, type B; S stops the program.

If a number is entered, it will be poked in as the new value for that memory location. Any other key will cause a halt with an error. If you aren't embarrassed by error messages, you can delete lines 50 and 90 and still use S to stop.

Listing 2 adds some frills but doesn't add any utility to the monitor. The main change is that the INKEY$ function is used instead of the Input statement. This means you don't have to keep pressing Enter. Memory locations advance and are displayed as long as you keep pressing F. At the end of the screen, you have to press Cont and Enter to continue. Line 27 puts the computer in its slow mode so you can see the values as they're displayed.

To change a value, first press C, then type the new value and press Enter.

Line 30 allows you to press a wrong key without any harm. If a wrong key is pressed, the program falls through to line 55, but it pokes the original value of the location back in—no changes have been made.■

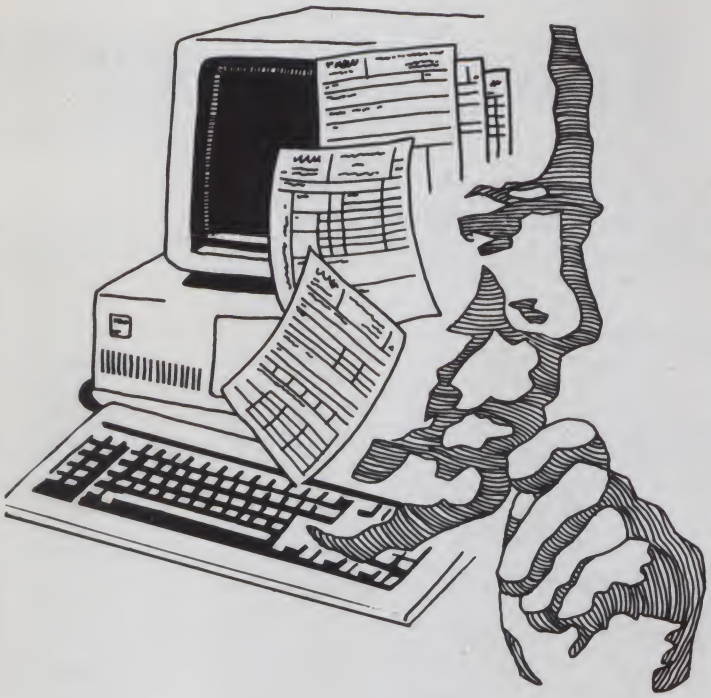
```
10 REM MEMORY MONITOR F TO LOOK FORWARD B TO LOOK BACK S TO STOP,
   OR ENTER A NUMBER TO POKE A NEW VALUE
20 PRINT "START AT ?"
25 INPUT L
30 PRINT TAB 2;L;TAB 10;PEEK L;TAB 17;CHR$ (PEEK L)
35 INPUT R$
40 IF R$="F" THEN GOTO 70
45 IF R$="B" THEN GOTO 80
50 IF R$="S" THEN GOTO 90
55 POKE L,VAL (R$)
60 GOTO 30
70 LET L=L+1
75 GOTO 30
80 LET L=L-1
85 GOTO 30
90 STOP
```

Listing 1.

```
10 REM MEMORY MONITOR F TO LOOK FORWARD B TO LOOK BACK C TO
   CHANGE A VALUE S TO STOP
20 PRINT "START AT ?"
25 INPUT L
27 SLOW
30 LET R$=STR$ (CODE (CHR$ (PEEK L) ) )
35 PRINT TAB 2;L;TAB 10;PEEK L;TAB 17;CHR$ (VAL R$)
37 IF INKEY$=" " THEN GOTO 37
40 IF INKEY$="F" THEN GOTO 70
45 IF INKEY$="B" THEN GOTO 80
50 IF INKEY$="S" THEN GOTO 90
52 IF INKEY$="C" THEN INPUT R$
55 POKE L,VAL (R$)
60 GOTO 30
70 LET L=L+1
75 GOTO 30
80 LET L=L-1
85 GOTO 30
90 STOP
```

Listing 2.

Address correspondence to Edward Rager, 9360 Tasmania Ave., Baton Rouge, LA 70810.



Writing Off Your Computer

With April 15 rapidly approaching, you will be glad to learn that your micro may be tax-deductible! The authors, two tax experts, detail who qualifies and for how much.

By Donald V. Saftner and Cherie J. O'Neil

Many common uses of your personal computer may qualify it for a tax deduction, which can effectively reduce its cost. If you subtract the tax savings associated with a purchase from the out-of-the-pocket cost of the computer, it's possible to determine the after-tax cost of a computer. Maybe you *can* afford that computer or peripheral that seemed out of reach or, if you have already made a purchase, perhaps you're in for a pleasant surprise when you prepare your tax return!

Who Qualifies?

There are two major classes of use that make it possible to list your computer as a tax deduction:

- Trade or business.
- Production or maintenance of income.

In the first category, the Internal Revenue Code permits a deduction for all of the ordinary and necessary expenses paid or incurred during the taxable year in carrying on any trade or business.

Since "trade or business" isn't defined in the code, the everyday usage of these terms applies. Generally, a trade or business is some line of work or form of occupation carried on with the intent of making a profit.

It isn't necessary to show that a profit was made, only to show that the *intent* was to make profit. Expenses incurred by an employee or a professional person also qualify as trade or business expenses. Examples of uses that fall into this trade or business category include: a businessman maintaining records, such as inventory or payroll; a teacher maintaining grade records or preparing class plans; a professional writer who uses a word processor package; an executive who uses the computer to catch up on "paperwork" at home; or even the aspiring programmer who hopes to sell his video game creation.

In the second category, the Internal Revenue Code permits a deduction for all of the ordinary and necessary expenses paid or incurred during the taxable year for the production or collection of income; for the management, conservation or maintenance of property held for the production of income; or in connection with the determination, collection or refund of any tax.

Although you may not be using your personal computer for a trade or business, you may still qualify for tax savings for a wide variety of nonbusiness activities.

For example, investors who own securities and/or real estate qualify if they use the computer for selecting investments or maintaining records of their investments. Individuals using a personal computer to maintain records necessary for the preparation of their tax returns also qualify. Therefore, tax savings from the purchase of a personal computer are available to a wide range of computer users—businessmen, professionals, employees, investors and even taxpayers.

Program Notes

At this point, you should have a general understanding of which tax savings are available.

The following section is an overview of a program that can help you maximize tax savings associated with the purchase of a computer. The program is written in advanced Basic (BasicA) for an IBM PC with at least 64K and an 80-column display. Inputs, processing and output are covered in detail. The discussion of the outputs centers on using it to complete the appropriate federal income tax forms.

Donald Saftner and Cherie O'Neil (307 Pamplin Hall, Virginia Tech, Blacksburg, VA 24061) are assistant professors of accounting at Virginia Polytechnic Institute and State University.

Some special situations also are reviewed.

The program begins by displaying a title screen while variables are initialized. It then writes the main display. Refer to Fig. 1 to see the four parts, labeled I through IV, of the main display.

Part I is the output of the program. Part II displays data that you supply to the program. The data is actually entered one item at a time on the line labeled Part III. Error messages are displayed on the empty line labeled Part IV.

The main display initially appears as shown in Fig. 1. The program requests values for lines 1–5. In Fig. 1, Part III, you can see this process beginning with a request for line 1 information. After these five values have been entered, the program calculates the optimal tax treatment and fills in the values for Part I. At this point, the display appears as shown in Fig. 2.

The program then allows the data to be changed, one item at a time, so that alternative situations can be explored. To do this, the program goes into a loop that consists of three steps.

First, the program asks which line you wish to change (shown at the bottom of Fig. 2). The program then requests an amount for that line, recalculates the top values and displays them. This loop repeats until a line number of zero is entered, which causes the program to end.

```
      DATE:11-04-1983  TIME:00:31:32      COST    TAX      ACRS
                                                SAVING     BASIS

I   TAX TREATMENT:
        EXPENSE.....................
        CAPITALIZE WITH REDUCED BASIS.
        CAPITALIZE WITH REDUCED ITC...
        IGNORE BECAUSE PERSONAL USE...
    TOTAL.....................................
    LESS ITC..................................
    LESS OTHER TAX SAVINGS (EXP./ACRS)
    AFTER TAX COST OF COMPUTER.........

II  INPUTS:
     1. % of cost for trade or business (0-100).....................%    0.00
     2. % of cost for production or maintenance of income (0-100)..%    0.00
        % of cost for personal use.....................................% 100.00   100.00
     3. interest rate for discounting (typically 5-25) (0-100).....%            0.00
     4. marginal tax bracket (0-65).................................%            0.00
     5. total cost of computer and related materials (0-99999)......           $0.00
     6. maximum expense amount (1983:5000, 1984:7500, 1985:10000)...        $5000.00

III  1. % of cost for trade or business (0-100).....................% ?
IV
```

Fig. 1. Four parts of main display of tax treatment program.

```
      DATE:11-04-1983  TIME:00:38:35      COST    TAX      ACRS
                                                SAVING     BASIS

TAX TREATMENT:
    EXPENSE.....................  5000.00  2500.00
    CAPITALIZE WITH REDUCED BASIS. 2000.00   956.93  1900.00
    CAPITALIZE WITH REDUCED ITC...    0.00     0.00     0.00
    IGNORE BECAUSE PERSONAL USE...    0.00     0.00
TOTAL.....................................  7000.00  3456.93  1900.00
LESS ITC.....................................  200.00
LESS OTHER TAX SAVINGS (EXP./ACRS)  3256.93
AFTER TAX COST OF COMPUTER.....  3543.07

INPUTS:
 1. % of cost for trade or business (0-100).....................% 100.00
 2. % of cost for production or maintenance of income (0-100)..%   0.00
    % of cost for personal use.....................................%   0.00   100.00
 3. interest rate for discounting (typically 5-25) (0-100).....%            12.00
 4. marginal tax bracket (0-65).................................%            50.00
 5. total cost of computer and related materials (0-99999).....           $7000.00
 6. maximum expense amount (1983:5000, 1984:7500, 1985:10000)...         $5000.00

Key line number you wish to change (1-6) or 0 to exit program... ?
```

Fig. 2. Request for line number change.

Program Prompts

Prompts 1 and 2 require an estimate of the percent of time the computer is used for "trade or business" and "production or maintenance of income," respectively. The sum of these two categories and the use of the computer for personal (e.g., entertainment) reasons should add up to 100 percent.

The greater the percent of use for personal reasons, the less the total tax savings will be. You should be especially careful in estimating the amounts for prompts 1 and 2. These percents and the cost figure in prompt 5 are the numbers you must be able to substantiate if the IRS audits your return.

Line 3 is the interest rate the program uses in a process known as discounting. Essentially, discounting reflects the fact that most people prefer to receive a dollar now rather than in the future. To decide what figure to use here, consider the interest rate you are currently earning on savings or paying on loans. For instance, if your tax bill is reduced, will the tax savings mean that you won't have to borrow as much as you would have previously? If so, then the loan interest

Form **4562** (Rev. September 1982) Department of the Treasury (C) Internal Revenue Service

Depreciation and Amortization

▶ See separate instructions.
▶ Attach this form to your return.

OMB No. 1545-0172 Expires 8/31/85

67

Name(s) as shown on return: JOHN SMITH

Identifying number: 123-45-6789

Business or activity to which this form relates: SMITH SOFTWARE SERVICES CO

(Form 1040) Depreciation

Section A Election to expense recovery property (Section 179)

A. Class of property	B. Cost	C. Expense deduction
Computer	7000.00	5000.00

1 Total (not more than $5,000). Enter here and on line 8 (Partnerships—enter this amount on Schedule K (Form 1065)) 5000.00

Section B Depreciation of recovery property

A. Class of property	B. Date placed in service	C. Cost or other basis	D. Recovery period	E. Method of figuring depreciation	F. Percentage	G. Deduction for this year
2 Accelerated Cost Recovery System (ACRS) (See instructions):						
(a) 3-year property						
(b) 5-year property	12-10-82	1900.00	5	ACRS	15	285.00

Fig. 3. This example, along with Fig. 4., shows how information from Fig. 2 would be reported.

rate will probably be appropriate to use for discounting. If a reduction in your tax bill would mean that you can put more in savings, then the return on your savings will be a reasonable number to use for discounting.

Prompt 4 is the marginal tax bracket percent. To decide what percent should be entered, refer to tax rate schedules in the instructions to your federal income tax forms for the current year. If you don't have these handy, you can approximate the percent by using the tax rate schedules from the previous year.

Prompt 5 is the total cost of the computer and related materials. When determining the total cost of a personal computer system, include the cost of all the hardware—the computer's central processing unit, monitor and keyboard plus peripheral equipment, such as tape or disk drives, printer and modem.

> Purchased software can be included as part of the cost of the personal computer.

Another important part of the personal computer system that can be included in the total is the cost of purchased software and instruction manuals. The Internal Revenue Service holds that, where the cost of purchased computer software is a part of the total cost if a computer, the total cost may be capitalized (i.e., it may be used in figuring the total cost as an input to this program).

When software is purchased separately from hardware, the appropriate tax treatment is not as clear cut. The IRS indicates that where costs are separately stated, software should be treated as an intangible asset and amortized over 60 months. This places software outside the realm of this

A Few Tips on Deducing Your Deductions

In order to understand the processing of the program, it's necessary to understand certain basic tax rules.

Broadly speaking, there are two kinds of tax savings associated with acquiring a personal computer: a deduction that reduces taxable income and a credit that reduces tax liability. The tax savings associated with a deduction are based on a marginal tax rate. For example, a $100 deduction to a taxpayer in the 40 percent marginal tax bracket results in a $40 reduction in the tax liability; a $100 tax credit results in a $100 reduction in the tax liability.

When comparing the tax savings of deductions versus credits, it's first necessary to reduce the deduction to its after-tax savings (i.e., multiply the deduction by the appropriate marginal tax rate).

The cost of tangible personal property (a personal computer, for example) used in a trade or business may be recovered in one of two ways. First, the purchase price may be capitalized as an asset with a percentage of the cost deducted annually. For personal computers purchased after December 31, 1980, the five-year accelerated cost-recovery period normally applies.

The Internal Revenue Code specifies the recovery percentages to be used in each of the five recovery years: 15, 22, 21, 21 and 21 percent in years 1–5, respectively. The 15 percent recovery allowance for year 1 applies, regardless of which day in the year the asset was purchased. For example, a $1000 five-year cost-recovery asset yields a $150 tax deduction in the year of purchase, provided it was placed in service by the last day of the tax year.

Also note that the five-year recovery period has nothing to do with the useful life of the asset. It's an arbitrary period of time that has been specified by the tax law. A personal computer is five-year property whether or not its useful life is five years.

When a personal computer is recorded as an asset and the annual cost-recovery deduction is taken, the ten percent investment tax credit is available in the year of purchase. The purchase of a $1000 five-year cost-recovery asset results in an investment tax credit of $100. When an investment tax credit is taken on a cost recovery asset purchased after December 31, 1982, the amount of the asset subject to the cost-recovery allowance is reduced by one-half of the regular investment tax credit. For a $1000 asset on which a $100 investment tax credit was claimed, the cost-recovery deductions are computed using an adjusted basis of $950:

$[\$1{,}000 - (\frac{1}{2} \times (1{,}000 \times .10))]$.

The taxpayer may elect to use the full basis of $1000 in computing the cost-recovery deduction, but, if this is done, the allowable investment tax credit percentage is then reduced by two percentage points to eight percent. For a $1000 asset, the investment tax credit will be $80. The total tax savings when the asset is capitalized is the sum of the investment tax credit plus the present value (i.e., discounting future cash flows back to the present) of the after-tax cost savings of cost-recovery deductions.

If a 40 percent marginal tax rate is assumed, the tax savings in the first year associated with the purchase of a $1000 asset, if the full investment tax credit is taken, is $157:

$[(\$1{,}000 \times .10) + (\$1{,}000 - (\frac{1}{2} \times (\$1{,}000 \times .10)) \times .15 \times .4)]$.

If the reduced investment tax credit is taken, the first-year tax savings is $140:

$[(\$1{,}000 \times .08) + (\$1{,}000 \times .15 \times .4)]$.

In years 2–5, the tax savings from the cost recovery deduction will be $83.60 in year two and $79.80 in years 3–5, respectively, if the full investment tax credit is taken, or $88 in year 2 and $84 in years 3–5 if the reduced investment tax credit is taken.

As you can see from the example, computing the total savings using the accelerated cost-recovery deduction and the investment tax credit requires present value analysis, since the cash flows in each of the five tax years are different.

A simpler alternative, found in the Internal Revenue Code, permits the "expensing" of recovery property in the year in which it is acquired. The code limits the applicability of the expensing provision to any recovery property that meets the definition of property used in a trade or business. The option isn't available for property held merely for the production of income.

For those taxpayers using a personal computer in a trade or business, the election to expense permits the entire tax savings to be recognized in the year of purchase. For a taxpayer in the 40 percent marginal tax bracket, the purchase of a $1000 asset will yield a first-year tax savings of $400:

$(\$1{,}000 \times .4)$.

While the expensing provision is easy to compute and understand, it may not, in the long run, result in maximum tax savings, because "expensed" assets do not qualify for the investment tax credit. Thus, you must decide which method offers the greatest after-tax savings.

Such a decision requires a comparison of the net present value of the tax savings that can be achieved under each alternative. This comparison is essentially what the program does for you.

D.S.
C.O.

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☐ Appliance Servicing
☐ Automotive Servicing
☐ Auto Air Conditioning
☐ Air Conditioning, Heating, Refrigeration & Solar Technology
☐ Building Construction

Name (Please Print) Age

Street

City/State/Zip

Accredited by the Accrediting Commission of the National Home Study Council

article (i.e., don't include it in the total cost as an input to the program.

The courts have chosen not to follow the IRS lead in two recent court cases (32 AFTR 2d 73-5094 and 551 F2d 599). It has been suggested by some writers that mass-marketed (not custom-written) software should be treated in the same way as hardware for tax purposes. By following the line of reasoning expressed by the courts, purchased software can be included as a part of the cost of the personal computer.

Prompt 6 is the maximum expense amount. It is preset at $5000, which is the appropriate amount for the 1983 tax year. This figure should be changed to $7500 for tax year 1984 returns and to $10,000 for 1985 returns.

Program Output

You can receive a personal computer tax benefit in one of three ways:

1. Expense the cost of the personal computer.
2. Record the purchase of the personal computer as an asset, claim the regular investment tax credit of ten pecent, reduce the basis by one-half of the investment tax credit and apply the five-year cost recovery percentages to the net basis.
3. Record the purchase of the computer as an asset, claim the reduced investment tax credit of eight percent and apply the five-year cost-recovery percentages to the full basis.

The program uses the input values to attempt to determine which combination of the above alternatives will result in maximum tax savings for you. In Fig. 2, the three alternatives are labeled Expense, Capitalize with Reduced Basis and Capitalize with Reduced ITC, respectively.

In the first column, Cost, the total cost of the computer from Prompt 5 is allocated among the three alternatives and the personal use category. In the column Tax Saving, the amount your tax bill is reduced by or your refund is increased to is displayed. (The column labeled ACRS BASIS will be discussed later.)

Figs. 3 and 4 are examples for a fictitious John Smith showing how the information from Fig. 2 would be reported. The amount shown in the Cost column on the Expense line should be placed on Form 4562, part I, section A, column C. The total cost of the computer (from prompt 5) should be placed in column B of that same section.

In Fig. 2, the amount on the line labeled Capitalize with Reduced Basis in the column ACRS BASIS should also be placed on Form 4562. This amount is placed in part I, section B, line 2, column C. Line 2 of this form

Form 3468 — Computation of investment Credit

Department of the Treasury Internal Revenue Service (0)

▶ Attach to your tax return.
▶ Schedule B (Business Energy Investment Credit) on back.

OMB No. 1545-0155
1982
27

Name(s) as shown on return: JOHN SMITH
Identifying number: 123-45-6789

PART I—Elections

A The corporation elects the basic or basic and matching employee plan percentage under section 48(n)(1) ☐
B I elect to increase my qualified investment to 100% for certain commuter highway vehicles under section 46(c)(6) . . ☐
C I elect to increase my qualified investment by all qualified progress expenditures made this and all later tax years . . ☐
Enter total qualified progress expenditures included in column (4), Part II ▶
D I claim full credit on certain ships under section 46(g)(3) (See instruction B for details.) ☐

PART II—Qualified Investment

1 Recovery Property		Line	(1) Class of Property	(2) Unadjusted Basis	(3) Applicable Percentage	(4) Qualified Investment (Column 2 x column 3)
Regular Percentage	New Property	(a)	3-year		60	
		(b)	Other	2000.00	100	2000.00
	Used Property	(c)	3-year		60	
		(d)	Other		100	
§48(q) Election to Reduce Credit (instead of adjusting basis) FY 1982–83 filers only (see instr.)	New Property	(e)	3-year		40	
		(f)	Other		80	
	Used Property	(g)	3-year		40	
		(h)	Other		80	
2 Nonrecovery property—Enter total qualified investment (See instructions for line 2) . .					2	
3 New commuter highway vehicle—Enter total qualified investment (See Instruction D(2)) .					3	
4 Used commuter highway vehicle—Enter total qualified investment (See Instruction D(2)) .					4	
5 Total qualified investment in 10% property—Add lines 1(a) through 1(h), 2, 3, and 4 (See instructions for special limits)					5	2000.00
6 Qualified rehabilitation expenditures—Enter total qualified investment for:						
a 30-year-old buildings					6a	
b 40-year-old buildings					6b	
c Certified historic structures (Enter the Dept. of Interior assigned project number)					6c	
7 Corporations checking election box A above—add lines 5, 6a, 6b, and 6c . . ▶ 7						
8 10% of line 5					8	200.00
9 15% of line 6a					9	

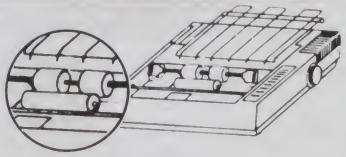
Fig. 4. Together with Fig. 3, this example shows how information from Fig. 2 would be reported.

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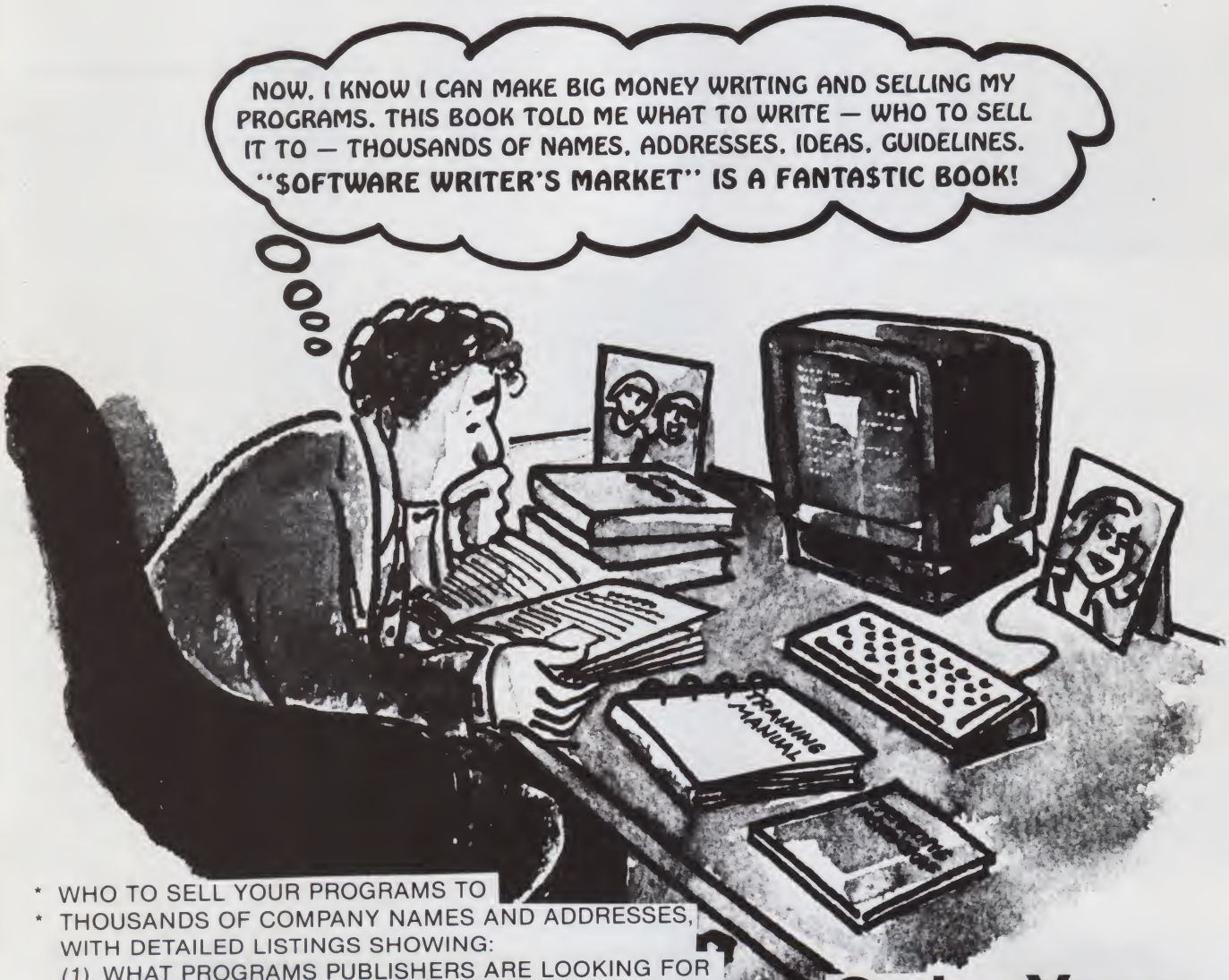
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must be completed in the current year and in each of the following four years. In the first year, column F is set at 15 and then 22, 21, 21 and 21, respectively, in each of the following four years. Column G is the product of columns C and F.

Form 3468 Computation of Investment Credit (see Fig. 4) must also be completed for the example in Fig. 2. The amount on the line labeled Capitalize with Reduced Basis in the Cost column should be placed in Part II on line 1 (b) or (d) in column 2 and column 4. The amount is also placed on line 5. Line 8 is ten percent of line 5. Note that the number on line 8 also appears in Fig. 2 on the line labeled LESS ITC.

Fig. 5 is another example of the output of the program. Figs. 6 and 7 are examples for a fictitious Mary Smith showing how the information from Fig. 5 would be reported. Form 4562 (Fig. 6) is completed in a manner similar to the earlier example. Form 3468 (Fig. 7) is also completed in a similar

Tax savings can dramatically reduce the after-tax cost of a computer.

```
     DATE:11-04-1983  TIME:00:34:21        COST     TAX       ACRS
                                                    SAVING    BASIS
TAX TREATMENT:
     EXPENSE.....................          0.00      0.00
     CAPITALIZE WITH REDUCED BASIS.        0.00      0.00      0.00
     CAPITALIZE WITH REDUCED ITC...     2400.00   1176.74   2400.00
     IGNORE BECAUSE PERSONAL USE...      600.00      0.00
TOTAL.............................      3000.00   1176.74   2400.00
LESS ITC..........................       192.00
LESS OTHER TAX SAVINGS (EXP./ACRS)       984.74
AFTER TAX COST OF COMPUTER........      1823.26

INPUTS:
 1. % of cost for trade or business (0-100).....................%    0.00
 2. % of cost for production or maintenance of income (0-100)..%   80.00
    % of cost for personal use.................................%   20.00   100.00
 3. interest rate for discounting (typically 5-25) (0-100).....%             8.00
 4. marginal tax bracket (0-65)................................%            48.00
 5. total cost of computer and related materials (0-99999)......          $3000.00
 6. maximum expense amount (1983:5000, 1984:7500, 1985:10000)...          $5000.00

Key line number you wish to change (1-6) or 0 to exit program... ?
```

Fig. 5. Example of output.

Form 4562 (Rev. September 1982) Department of the Treasury Internal Revenue Service (0)

Depreciation and Amortization

▶ See separate instructions.
▶ Attach this form to your return.

OMB No. 1545-0172 Expires 8/31/85

67

Name(s) as shown on return: MARY SMITH

Identifying number: 987-65-4321

Business or activity to which this form relates: SMITH REAL ESTATE CO.

[] Depreciation

Section A Election to expense recovery property (Section 179)

A. Class of property	B. Cost	C. Expense deduction

1 Total (not more than $5,000). Enter here and on line 8 (Partnerships—enter this amount on Schedule K (Form 1065))

Section B Depreciation of recovery property

A. Class of property	B. Date placed in service	C. Cost or other basis	D. Recovery period	E. Method of figuring depreciation	F. Percentage	G. Deduction for this year
2 Accelerated Cost Recovery System (ACRS) (See instructions):						
(a) 3-year property						
(b) 5-year property	9-30-83	2400.00	5	ACRS	15	360.00

Fig. 6. Sample Depreciation and Amortization form.

manner, except now the cost figure is placed on line 1, (f) or (h).

Fig. 8 is a summary of how the personal computer is reported on the federal income tax forms. There are three categories of taxpayers for this purpose:

- Trade or business, self-employed;
- Trade or business, employee;
- Production or maintenance of income. Categories 1 and 2 are subsets of the trade or business classification discussed earlier in reference to input line 1. Class 3 is the same classification discussed in reference to input line 2.

Special Situations

This article was written using the tax laws as of November 1, 1983. Check the Important Tax Law Changes section of your Federal Income Tax Instructions to make sure that the basic alternatives mentioned at the beginning

Form **3468** — Department of the Treasury, Internal Revenue Service (0)

Computation of Investment Credit

▶ Attach to your tax return.
▶ Schedule B (Business Energy Investment Credit) on back.

OMB No. 1545-0155 — **1982** — 27

Name(s) as shown on return: MARY SMITH

Identifying number: 987-65-4321

PART I—Elections

A The corporation elects the basic or basic and matching employee plan percentage under section 48(n)(1) ☐
B I elect to increase my qualified investment to 100% for certain commuter highway vehicles under section 46(c)(6) . . ☐
C I elect to increase my qualified investment by all qualified progress expenditures made this and all later tax years . . ☐
Enter total qualified progress expenditures included in column (4), Part II ▶
D I claim full credit on certain ships under section 46(g)(3) (See Instruction B for details.) ☐

PART II—Qualified Investment

1 Recovery Property		Line	(1) Class of Property	(2) Unadjusted Basis	(3) Applicable Percentage	(4) Qualified Investment (Column 2 × column 3)
Regular Percentage	New Property	(a)	3-year		60	
		(b)	Other		100	
	Used Property	(c)	3-year		60	
		(d)	Other		100	
§48(q) Election to Reduce Credit (instead of art using basis) FY 1982–83 filers only (see instr.)	New Property	(e)	3-year		40	
		(f)	Other	2400.00	80	1920.00
	Used Property	(g)	3-year		40	
		(h)	Other		80	

2 Nonrecovery property—Enter total qualified investment (See instructions for line 2) . .	2	
3 New commuter highway vehicle—Enter total qualified investment (See Instruction D(2)) .	3	
4 Used commuter highway vehicle—Enter total qualified investment (See Instruction D(2)) .	4	
5 Total qualified investment in 10% property—Add lines 1(a) through 1(h), 2, 3, and 4 (See instructions for special limits)	5	1920.00
6 Qualified rehabilitation expenditures—Enter total qualified investment for:		
a 30-year-old buildings	6a	
b 40-year-old buildings	6b	
c Certified historic structures (Enter the Dept. of Interior assigned project number)	6c	
7 Corporations checking election box A above—add lines 5, 6a, 6b, and 6c . . \| 7 \|		
8 10% of line 5	8	192.00
9 15% of line 6a	9	
10 20% of line 6b	10	

Fig. 7. Sample Computation of Investment Credit form.

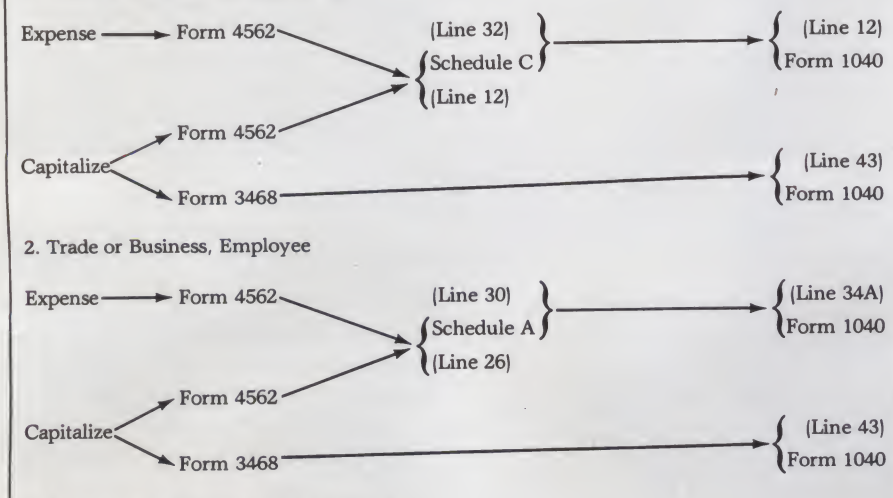


Fig. 8. Summary of reporting requirements.

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Listing 1. Program to help maximize tax savings when buying a microcomputer.

```
 10 REM This program attempts to maximize the present value of tax savings
20 REM       associated with the purchase of a personal computer.
30 REM
40 REM Don Saftner and Cherie O'Neil (1983)
50 REM
60 REM Copyright 1983
70 REM
100 GOSUB 1000 ' output title screen and initialize
200 GOSUB 2000 ' output main screen except for top values
300 GOSUB 3000 ' force answers to lines 1-5
400 GOSUB 4000 ' calculate top values and output
500 GOSUB 5000 ' request line # and amount
600 GOTO 400
975 REM
980 REM
985 REM output title screen and initialize
990 REM
995 REM
1000 KEY OFF:CLS
1130 LOCATE 4,1:PRINT SPC(28) "ATTEMPT TO MAXIMIZE THE":PRINT " "
1140 PRINT SPC(26) "PRESENT VALUE OF TAX SAVINGS":PRINT " "
1150 PRINT SPC(24) "WHEN BUYING A PERSONAL COMPUTER":PRINT " ":PRINT " "
1160 PRINT SPC(37) "-by-":PRINT " ":PRINT " "
1180 PRINT SPC(26) "DON SAFTNER & CHERIE O'NEIL":PRINT " ":PRINT " "
1200 PRINT SPC(31) "(COPYRIGHT 1983)"
1240 LOCATE 21,1:PRINT "Read the documentation by the above authors before using
 this program."
1280 LOCATE 23,1:PRINT "Please wait while variables are initialized....";
1290 DEFINT I:DEF FNR(X)=INT(X*100+.5)/100
1300 DIM CCR(5):CCR(1)=.15:CCR(2)=.22:CCR(3)=.21:CCR(4)=.21:CCR(5)=.21
1320 DIM MSG$(20),ICOL(20),IROW(20)
1340 D$="$$#####.##":R$="######.##":P$="###.##"
1350 BLANKS$="

1360 PTRADE=0:PMAINT=0:PINTRT=0:PTAXBR=0:COST=0:PVPERS=0
1380 PPERS=100:PTOTAL=100
1400 MEXPS=5000:MAX=99999.994#:MCAPR=MAX:MCAPI=MAX
1420 FOR I=1 TO 19:READ IROW(I),ICOL(I),MSG$(I):NEXT I
1440 DATA 14,1," 1. % of cost for trade or business (0-100).....%
"
1460 DATA 15,1," 2. % of cost for production or maintenance of income (0-100)..%
"
1480 DATA 17,1," 3. interest rate for discounting (typically 5-25) (0-100).....%
"
1500 DATA 18,1," 4. marginal tax bracket (0-65).....%
"
1520 DATA 19,1," 5. total cost of computer and related materials (0-99999).....
"
1540 DATA 20,1," 6. maximum expense amount (1983:5000, 1984:7500, 1985:10000)...
"
1620 DATA 16,1,"    % of cost for personal use.....%
"
1640 DATA 1,5,"DATE:            TIME:            COST    TAX      ACRS"
1650 DATA 2,47,"SAVING    BASIS"
1660 DATA 3,1,"TAX TREATMENT:"
1680 DATA 4,1,"    EXPENSE....."
1700 DATA 5,1,"    CAPITALIZE WITH REDUCED BASIS."
1720 DATA 6,1,"    CAPITALIZE WITH REDUCED ITC..."
1740 DATA 7,1,"    IGNORE BECAUSE PERSONAL USE..."
1760 DATA 8,1,"TOTAL....."
1780 DATA 9,1,"LESS ITC....."
1800 DATA 10,1,"LESS OTHER TAX SAVINGS (EXP./ACRS)"
1820 DATA 11,1,"AFTER TAX COST OF COMPUTER....."
1840 DATA 13,1,"INPUTS:"
1850 LOCATE 23,1:PRINT "Press any Key to continue.
1860 ANS$=INKEY$:IF ANS$="" THEN 1860
1965 RETURN
1970 REM
1975 REM
1980 REM
1985 REM output main screen except top values
1990 REM
1995 REM
2000 CLS
2035 FOR I=1 TO 19:LOCATE IROW(I),ICOL(I):PRINT MSG$(I):NEXT I
2040 GOSUB 9900
2045 GOSUB 2100
2050 GOSUB 2200
2055 GOSUB 2300
2060 GOSUB 2400
2065 GOSUB 2500
2070 GOSUB 2600
2085 GOSUB 2900
2099 RETURN
2100 LOCATE 14,66:PRINT USING P$;PTRADE:RETURN
2200 LOCATE 15,66:PRINT USING P$;PMAINT:RETURN
2300 LOCATE 17,74:PRINT USING P$;PINTRT:RETURN
2400 LOCATE 18,74:PRINT USING P$;PTAXBR:RETURN
2500 LOCATE 19,71:PRINT USING D$;COST:RETURN
2600 LOCATE 20,71:PRINT USING D$;MEXPS:RETURN
2900 LOCATE 16,66:PRINT USING P$;PPERS;:PRINT SPC(2);:PRINT USING P$;PTOTAL:RETU
RN
2975 REM
2980 REM
2985 REM force answers 1-5
2990 REM
2995 REM
3000 ILINE=1:GOSUB 3100
3030 ILINE=2:GOSUB 3200
3035 ILINE=3:GOSUB 3300
3040 ILINE=4:GOSUB 3400
3045 ILINE=5:GOSUB 3500
3050 RETURN
3075 REM
3080 REM
3085 REM the following subroutines accept amounts for lines 1-6 and edit them
3090 REM
3095 REM
3100 GOSUB 7100:IF AMT>100 THEN GOSUB 9200:GOTO 3100
3110 PTRADE=AMT:PPERS=100-PTRADE-PMAINT:IF PPERS<0 THEN PMAINT=PMAINT+PPERS:PPER
S=0
```

More

of the Program Output section of this article have not changed.

If you expense and/or capitalize a computer on your tax return and then sell it before five years have passed, you should consult a tax specialist. It will be necessary to recapture some of the tax benefits. This will also be true if you increase your personal use of the computer above your initial estimate.

In many states, expense and capitalize rules are similar to federal tax laws. In those states, your state marginal tax rate can simply be added to your federal marginal tax rate and the sum entered on line 4.

If your state's rules are significantly different than federal tax laws, you may want to consult a tax specialist to determine if the program's choice of alternatives would be best for your state return (and federal return, if your state requires the same treatment on both).

The program assumes that you have sufficient income to take the full investment tax credit in the current year. If the program suggests capitalizing your computer and you don't have sufficient income, a tax specialist should be consulted. You may want to choose another alternative or consider an Investment Tax Credit carryforward.

If you are in category 2 or 3 in Fig. 8, the program, in choosing among the alternatives, assumes that you are already itemizing your deductions. Note the use of Schedule A (for itemizing deductions) in Fig. 8.

The program also assumes that a single discount rate and single marginal tax rate are applicable over the next five years. If you're able to see into the future well enough to know that your rates will be changing and if you can estimate these changes, then the subroutine at line 4900 of the program should be changed to accept arrays for RTAXBR (i.e., marginal tax ratio) and RINTRT (i.e., 1+ discount rate ratio).

Conclusion

While some purchasers of personal computers acquire their machines strictly for personal use, a great number of purchasers use their machines in some business- or investment-related activity.

It's this latter category of individuals that have tax savings opportunities when purchasing a personal computer. Tax savings can dramatically reduce the after-tax cost of a computer.■

Listing continued.

```
3120 GOSUB 9400:GOSUB 9800
3140 RETURN
3200 GOSUB 7100:IF AMT>100 THEN GOSUB 9200:GOTO 3200
3240 PMAINT=AMT:PPERS=100-PTRADE-PMAINT:IF PPERS<0 THEN PTRADE=PTRADE+PPERS:PPER
S=0
3260 GOSUB 9400:GOSUB 9800
3290 RETURN
3300 GOSUB 7100:IF AMT>100 THEN GOSUB 9200:GOTO 3300
3320 GOSUB 9800:PINTRT=AMT:RINTRT=PINTRT/100+1:GOSUB 2300
3340 RETURN
3400 GOSUB 7100:IF AMT>65 THEN GOSUB 9200:GOTO 3400
3420 GOSUB 9800:PTAXBR=AMT:RTAXBR=PTAXBR/100:GOSUB 2400
3440 RETURN
3500 GOSUB 7100:IF AMT>MAX THEN GOSUB 9200:GOTO 3500
3520 GOSUB 9800:COST=AMT:GOSUB 2500
3540 RETURN
3600 GOSUB 7100:IF AMT>10000 THEN GOSUB 9200:GOTO 3600
3610 GOSUB 9800
3615 IF AMT<MEXPS THEN GOSUB 9600
3620 IF AMT>5000 THEN GOSUB 9800:LOCATE 25,1:PRINT "WARNING: YOU HAVE EXCEEDED T
HE 1983 EXPENSE LIMIT (see line 6 above)";:IF AMT>7500 THEN LOCATE 25,35:PRINT "
4";
3660 MEXPS=AMT:GOSUB 2600
3680 RETURN
3975 REM
3980 REM
3985 REM calculate top values and output
3990 REM
3995 REM
4000 TRADE=FNR(RTRADE*COST):MAINT=FNR(RMAINT*COST):SUMTM=TRADE+MAINT
4120 PERS=COST-SUMTM:EXPS=SUMTM:CAPITC=SUMTM:CAPBAS=SUMTM ' temporary values
4140 GOSUB 4650:GOSUB 4750:GOSUB 4850
4160 IF PVCAPI>PVCAPB THEN IORDER=2 ELSE IORDER=1
4180 IF PVCAPI>PVEXPS THEN IORDER=IORDER+2
4200 IF PVCAPB>PVEXPS THEN IORDER=IORDER+4
4220 ON IORDER GOSUB 8100,8200,8300,8400,8500,8600,8700,8800
4240 AMT=EXPS+CAPBAS+CAPITC
4260 PERS=COST-AMT:PV=PVEXPS+PVCAPB+PVCAPI:BASIS=BASISB+BASISI:XITC=XITCB+XITCI
4280 GOSUB 9900
4300 LOCATE 4,35:PRINT USING R$;EXPS,PVEXPS;
4320 LOCATE 5,35:PRINT USING R$;CAPBAS,PVCAPB,BASISB;
4340 LOCATE 6,35:PRINT USING R$;CAPITC,PVCAPI,BASISI;
4360 LOCATE 7,35:PRINT USING R$;PERS,PVPERS;
4380 LOCATE 8,35:PRINT USING R$;COST,PV,BASIS;
4400 LOCATE 9,35:PRINT USING R$;XITC;
4420 LOCATE 10,35:PRINT USING R$;PV-XITC;
4440 LOCATE 11,35:PRINT USING R$;COST-PV;
4460 RETURN
4575 REM
4580 REM
4585 REM find PV of EXPS (expense)
4590 REM
4595 REM
4600 IF EXPS>TRADE THEN EXPS=TRADE
4640 IF EXPS>MEXPS THEN EXPS=MEXPS
4645 IF EXPS<.005 THEN EXPS=0:PVEXPS=0:RETURN
4650 PVEXPS=FNR(RTAXBR*EXPS)
4670 RETURN
4675 REM
4680 REM
4685 REM find PV of CAPBAS (capitalize using the reduced basis alternative)
4690 REM
4695 REM
4700 IF CAPBAS>MCAPB THEN CAPBAS=MCAPB
4745 IF CAPBAS<.005 THEN CAPBAS=0:BASISB=0:XITCB=0:PVCAPB=0:RETURN
4750 TMP=CAPBAS*.95:GOSUB 4900
4765 BASISB=FNR(TMP):XITCB=FNR(.1*CAPBAS):PVCAPB=PVTMP+XITCB
4770 RETURN
4775 REM
4780 REM
4785 REM find PV of CAPITC (capitalize using the reduced ITC alternative)
4790 REM
4795 REM
4800 IF CAPITC>MCAPI THEN CAPITC=MCAPI
4845 IF CAPITC<.005 THEN CAPITC=0:BASISI=0:XITCI=0:PVCAPI=0:RETURN
4850 TMP=CAPITC:GOSUB 4900
4865 BASISI=FNR(TMP):XITCI=FNR(.08*CAPITC):PVCAPI=PVTMP+XITCI
4870 RETURN
4875 REM
4880 REM
4885 REM calculate present value (PV) using capital cost recovery (CCR) rules
4890 REM
4895 REM
4900 PVTMP=TMP*CCR(1)*RTAXBR:DEN=RINTRT
4960 FOR I=2 TO 5:PVTMP=PVTMP+((TMP*CCR(I)*RTAXBR)/DEN):DEN=DEN*RINTRT:NEXT I
4965 PVTMP=FNR(PVTMP)
4970 RETURN
4975 REM
4980 REM
4985 REM request line number and amount
4990 REM
4995 REM
5000 LOCATE 23,1:PRINT BLANKS$;
5110 GOSUB 7300
5120 LOCATE 23,1:PRINT "Key line number you wish to change (1-6) or 0 to exit pr
ogram...";
5130 GOSUB 7500:GOSUB 7900:ILINE=VAL(KB$)
5140 IF ILINE>6 THEN GOSUB 9200:GOTO 5000
5150 GOSUB 9800
5155 IF ILINE=0 THEN KEY ON:CLS:END
5160 ON ILINE GOSUB 3100,3200,3300,3400,3500,3600
5180 RETURN
7000 REM
7020 REM
7040 REM input amounts avoiding edit responses associated with BASIC's INPUT
7060 REM
7080 REM
7095 REM output request for line information and accept amount
7100 LOCATE 23,1:PRINT BLANKS$;
7140 LOCATE 23,1:PRINT MSG$(ILINE);:GOSUB 7200:AMT=VAL(ANS$):AMT=FNR(AMT):RETURN
7195 REM input up to 12 digits and store in ANS$
7200 GOSUB 7500
```

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Listing continued.

```
7220 FOR II=1 TO 12:GOSUB 7900:IF KB$=CHR$(13) THEN RETURN
7240 ANS$=ANS$+KB$:NEXT II
7260 RETURN
7295 REM clear input buffer
7300 KB$=INKEY$:IF KB$<>"" THEN 7300
7340 RETURN
7495 REM inititalize before putting cursor on screen
7500 ANS$=""
7520 IIY=23:IIX=66:LOCATE IIY,IIX:PRINT "?";:IIX=IIX+2
7540 RETURN
7895 REM input single numeric value
7900 LOCATE IIY,IIX,1:KB$=INKEY$:IF KB$="" THEN 7900
7920 IF LEN(KB$)=2 THEN KB$=RIGHT$(KB$,1)
7930 IF KB$>"/" AND KB$<":" THEN 7990
7940 IF KB$="." THEN 7990
7945 IF KB$=CHR$(13) THEN RETURN
7950 IF KB$<>CHR$(8) THEN LOCATE 25,1:PRINT "NOTE: ONLY NUMBERS, DECIMAL POINT,
BACKSPACE, PrtSc AND RETURN ARE ACCEPTED";:GOTO 7900
7960 ILNGTH=LEN(ANS$):IF ILNGTH=0 THEN 7900
7970 ILNGTH=ILNGTH-1:ANS$=LEFT$(ANS$,ILNGTH)
7980 IIX=IIX-1:LOCATE IIY,IIX:PRINT " ";:GOTO 7900
7990 LOCATE IIY,IIX:PRINT KB$:IIX=IIX+1
7999 RETURN
8000 REM
8020 REM
8040 REM these subroutines calculate the present value, basis and ITC distributi
on among the expense and capitalize options (the REM statement which precedes th
e subroutine indicates the optimum order)
8060 REM
8080 REM
8095 REM exps, capbas, capitc
8100 GOSUB 4600
8140 CAPBAS=SUMTM-EXPS:GOSUB 4700
8160 CAPITC=SUMTM-EXPS-CAPBAS:GOSUB 4800
8180 RETURN
8195 REM exps, capitc, capbas
8200 GOSUB 4600
8240 CAPITC=SUMTM-EXPS:GOSUB 4800
8260 CAPBAS=SUMTM-CAPITC-EXPS:GOSUB 4700
8280 RETURN
8395 REM capitc, exps, capbas
8400 GOSUB 4800
8440 EXPS=SUMTM-CAPITC:GOSUB 4600
8480 CAPBAS=SUMTM-CAPITC-EXPS:GOSUB 4700
8490 RETURN
8495 REM capbas, exps, capitc
8500 GOSUB 4700
8540 EXPS=SUMTM-CAPBAS:GOSUB 4600
8580 CAPITC=SUMTM-CAPBAS-EXPS:GOSUB 4800
8600 RETURN
8695 REM capbas, capitc, exps
8700 GOSUB 4700
8720 GOSUB 4700
8740 CAPITC=SUMTM-CAPBAS:GOSUB 4800
8760 EXPS=SUMTM-CAPBAS-CAPITC:GOSUB 4600
8780 RETURN
8795 REM capitc, capbas, exps
8800 GOSUB 4800
8840 CAPBAS=SUMTM-CAPITC:GOSUB 4700
8860 EXPS=SUMTM-CAPITC-CAPBAS:GOSUB 4600
8880 RETURN
9000 REM
9020 REM
9040 REM miscellaneous subroutines for screen display
9060 REM
9080 REM
9195 REM typical answer to edit check
9200 GOSUB 9800
9220 LOCATE 25,1:PRINT "ERROR: AMOUNT ENTERED IS NOT WITHIN THE ALLOWED RANGE";:
RETURN
9395 REM calculate rates and output percents
9400 RTRADE=PTRADE/100:RMAINT=PMAINT/100
9440 GOSUB 2100:GOSUB 2200:GOSUB 2900
9480 RETURN
9595 REM warning if reduce size of maximums
9600 LOCATE 25,1:PRINT "WARNING: MAXIMUM BELOW UPPER LIMIT, NONOPTIMAL SOLUTION
MAY RESULT";:RETURN
9795 REM erase error line
9800 LOCATE 25,1,0:PRINT BLANK$;:RETURN
9895 REM initialize date and time at top of screen
9900 TDATE$=DATE$:TTIME$=TIME$:LOCATE 1,10:PRINT TDATE$:LOCATE 1,27:PRINT TTIME$
:RETURN
```

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The SMC-70: More Than a Micro

Sony's one and only microcomputer is an impressive system, but the SMC-70 (and SMC-70G) has a big advantage over the competition (especially when you're talking graphics)—it's manufactured by Sony, a company whose name is synonymous with video products. Author Guy Wright offers a glimpse of what Sony has up its sleeve.

By Guy Wright

When you build a new computer, you start with a CPU, develop the interfacing necessary to power it, connect it, supply it with data, communicate with it and create an environment in which it can work. Throw in some graphics capabilities and give it some sort of input and output so that people can communicate with it. Usually, when you have your computer built, the final step is hooking it up to a CRT of some kind.

If you were going to build a Sony SMC-70 or SMC-70G, you would follow the same procedure only in reverse. You would design a CRT, a very good CRT, and then build a computer that can utilize that CRT. This may sound a little backward, but in a sense this is what Sony has done with the SMC-70.

For a long time, Sony has been in the video/audio/television/electronics business and has done well...very well.

Known for Quality

One thing that Sony has always been noted for is the quality of its products. (Sony monitors are used in nearly every television studio in the world.) The company may wait until a number of other companies have been selling something for a while before coming out with its own version—a version that performs better than all of the others and that uses new technology. The SMC-70 and the SMC-70G are no exceptions.

On the surface, the SMC-70 (and 70G) seems to be just another computer. There's a nice silver case that makes it look a little like a stereo component, cute little microfloppy drives that "piggy-back" in a clever modular style, a sleek silver-gray dot matrix printer and, of course, a beautiful Sony monitor that makes the entire system look sexy (if electronic hardware can be considered sexy).

But at $995 for the unit itself, $500 for a single floppy drive ($795 for dual-floppies and $875 for cache disk), $725 for the printer and $895 for the monitor ($60 extra for the monitor stand), you would hope for more than a one-night stand. With a Z-80A at the heart of the SMC-70, it's tempting to think that Sony just wanted to cash in on an exploding computer market by putting out a Volkswagen in a Ferrari body. This is definitely not the case.

The Rolls Royce of Micros?

It might be closer to say that the SMC-70 is a Rolls Royce in a Ferrari body. You don't buy a Rolls Royce for the engine (even though a Z-80A may not be a supercharged turbo like a 68000, it is a powerful chip like the Rolls Royce engine); you buy a Rolls Royce for the fine detail and workmanship.

The SMC-70 is also a subtle machine in that every special feature is not immediately apparent. It's not until you begin to really explore the capabilities that Sony built in that you find it seems to have thought of nearly every contingency. And just in case Sony missed something, it made the SMC-70 so flexible that you can usually get the desired results even if they aren't part of the normal operating system.

Sony Disk Basic has nearly every command that you could want, plus a few more. There are facilities to connect up to 13 additional add-ons, including a "supercharger" board (for less than $1000) containing an Intel 8086 and an 8087 coprocessor, which will run CP/M-86 software and has an additional 256K (expandable up to 768K).

The 3½-inch microfloppy disk drives are more than slick, and they are nearly twice as fast as a normal floppy drive (if you'd rather use normal floppies, Sony does sell an eight-inch drive that will work on the SMC-70). Sony also has what it calls a cache disk, which has 256K of solid state volatile memory storage. The list of add-on equipment available for the SMC-70 could go on a long time and has been the subject of other articles

Guy Wright (39 Pleasant St., Apt. B-17, Northboro, MA 01532) is technical editor for Wayne Green publications RUN and HOT CoCo.

(with standard RS-232C and IEEE ports, it is possible to connect almost any peripheral device).

The software available is extensive and that list is also growing. As a computer, the SMC-70 is an exceptionally capable machine, as many have already stated in other places. (See *Microcomputing*, July 1983, "Sony's Marketable Micro," p. 66.)

Why This Article?

So why are we doing another review of the SMC-70? For one reason: the graphics capabilities of the SMC-70 are remarkable, and this is a graphics issue. The SMC-70 has 38K of video RAM divided into 2K character RAM, 2K attribute RAM (character color, background, flashing...), 2K of programmable character RAM, and 32K graphics RAM.

The display screen is generated in three sections: the border, graphics display screen and character display screen. The advantage of this system is that graphics and characters cannot only be displayed on the screen at the same time, but that they are completely independent of each other.

Many computers have some or all of the SMC-70's features but Sony is famous for its video equipment, and simply connecting the SMC-70 to a Sony Trinitron monitor doesn't even come close to what it had in mind for a computer/video mix.

Sony's Video Advantage

As mentioned at the beginning of the article, most computers seem to have been built with input and output being the last priorities. Sony seems to have worked in the opposite direction. If one word could describe the main advantage of an SMC-70 over any other computer, it would have to be video.

Sony is famous for its video and audio. They started with video equipment: recorders, cameras, disk players, editors and equipment found only in television studios. All of this equipment is usually brought together (using other equipment) to produce a video image. With the development of these video devices, Sony has also brought the price down to a point where the public can afford complete video systems.

The SMC-70 is the crossover between video and computer. There is no other computer on the market that can do a fraction of the things that the SMC-70 can do with video (although the Apple computer does have the ability to interface with some video equipment).



The Sony SMC-70 and SMC-70G represent new horizons in computer graphics and video. Through developments in interactive video technology, the SMC-70 will make things like visual databases a reality. Sony's commitment to the marriage of micros and video should result in radical changes in the ways computers are used.

If one word could describe the main advantage of an SMC-70 over any other computer, it would have to be video—the SMC-70 is the crossover between video and computer.

With the SMI-7044 NTSC superimposer the SMC-70 can be connected directly to the Sony LDP1000A Laser Disk Player, and through Basic, the computer can access any segment of video (and audio) either frame by frame or forward and backward. It also features three different playback speeds, search, freeze frame and anything else that can be done with a video disk player, all through Sony's Video Utility package software. (The SMC-70 can also act as a controller of audio, slide and film equipment.)

With 54,000 frames of random access video information on a single video disk and an additional 40 seconds of digitized audio information per frame, the visual possibilities are impressive, but the real value in this kind of system is its ability to be the center of an interactive video system.

Ford Motor Company currently uses video disks for training, and Sony is developing an interactive video training system so that a person won't just sit there and watch but will be asked questions, through the computer, and be shown different segments of the disk according to his answers.

John Hartigan, national marketing manager of Sony's Interactive Video Products Division, said that on one video disk they can put almost everything known about a piece of machinery and, using a light pen or other input device, you can build or take apart something and have it displayed on the screen in exactly that way for you to look at.

If, for example, a company wanted to teach its workers about transmissions, the disk would contain thousands of video images of transmissions in every state of assembly, so

you could "build" a transmission piece by piece and not only see the results of your work on the screen but, with the help of the computer program, you could be lead through the procedure step by step, encouraged when right and corrected when wrong.

Hartigan says that the main uses of the SMC-70's interactive video capabilities will be in the training/education areas, but he was quick to admit that most of the uses for a system like this haven't been thought of yet.

A Cross-Over Hit

This is where the Sony SMC-70 stands out as a new product. In reviews, the SMC-70 has been considered only from its computer standpoint, but the SMC-70 crosses over into areas that have not even been talked about.

From a video point of view, the SMC-70 brings all the advantages of a computer science to an area that only used computers peripherally. Now video can be completely changed. As Hartigan said, things will start to change when people realize that they no longer have to sit back and just watch TV. Now they'll be able to use it, learn from it and have it adapt and react to their actions and reactions, as in the video-arcade game Dragon's Lair, where the player controls the actions of an animated warrior as he battles through a fantasy fortress. The graphics are on a video disk, not computer generated.

> The SMC-70 crosses over into areas that have not even been talked about—programmers are going to learn they can do more than just compute.

As the player pushes a joystick, the internal computer decides which video sequence to show next.

At the same time that people are learning that they can do more with TV than just watch, programmers are going to learn that they can do more with a computer than just compute. The SMC-70 is basically a delivery vehicle in that it can use information already stored on a video disk. It can use that information in ways that no one has dreamed of, but it takes the SMC-70G to put that information on the disk to begin with.

SMC-70, SMC-70G: What's the Difference?

The primary difference between the SMC-70 and the SMC-70G is the ability of the SMC-70G to use a device known as a Genlocker. (If you are familiar with video production equipment, the Genlocker is similar to a gen lock sync generator.)

The other difference is the price. The SMC-70G is roughly twice as expensive as the SMC-70, but a TV camera is more expensive than a TV set. The SMC-70G is more of a "developer's tool," said Hartigan. It is used to organize and construct the video/software/audio into a package that can then be put onto video disks and later used by the SMC-70 owner.

What Does the Future Hold?

In summary, the SMC-70 and SMC-70G can be considered breakthroughs in the fields of video and computing. The challenges for programmers to develop interactive packages will open areas with outcomes that cannot be predicted.

The Sony computer does everything that a personal computer should and then some. The graphics possibilities are new and exciting: visual databases, animation, education, marketing, training and on and on.

As the technology develops, the entire field of interactive video programming as well as traditional computer programming will feel the changes. (A single video disk can hold approximately five gigabytes of digital information).

With RS-232C interfacing, a series of LDP1000As used with SMC-70s could mean radical changes for cable TV, universities, telecommunication and hundreds of other areas.■

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A Decision For Business Graphics

With the swing toward sophisticated business graphics, the Decision Mate V (a 12-inch green phosphor monitor) is a powerful and important tool.

By David D. Busch

We've seen the microcomputing industry swing sharply toward electronic spreadsheets and database programs. Now, look for business computer graphics as the next up-and-coming aid. All three tools are geared to help business people cope with the trend toward information overload.

Too much information can have as negative an impact on decision making as too little data. Before personal business computers began appearing on desktops, managers made some crucial decisions blindly. The information they needed wasn't available, or it was in a large mainframe computer database, accessible in a timely fashion only by the data processing staff.

Too Much Info?

Today, executives who are using microcomputers or terminals have more information than they can handle at their fingertips. In fact, it's easy to become overpowered by a flood of data, unsure of which screenful of numbers contains significant figures.

Many software products are designed to help organize and extract data. Financial spreadsheet programs like SuperCalc and CalcStar arrange figures in orderly columns that can be more easily absorbed and studied. Database management programs, such as dBase II or InfoStar, permit searching of data files by user-specified parameters.

Computer graphics is yet another tool for handling and presenting information. In the past, both hardware and software limitations kept business graphics from gaining wide acceptance. Graphics routines were slow and clumsy with some operating systems, and a lack of standards made it nearly impossible for programmers to write graphics programs that were portable.

All of that is beginning to change. Digital Research, which markets the CP/M operating systems, has introduced badly needed graphics routines for programmers. And hardware manufacturers such as NCR are acknowledging the need for microcomputers with business graphics.

New entries in the personal computer market include the NCR Decision Mate V.

Come to a Decision, Mate

The Decision Mate V's 12-inch green phosphor monochrome monitor, or its optional color monitor, can display a matrix of 640×400 dots, a total of 256,000 dots. This is double the 640×200 dot monochrome resolution of other popular personal computers. The NCR computer retains this same resolution in color mode.

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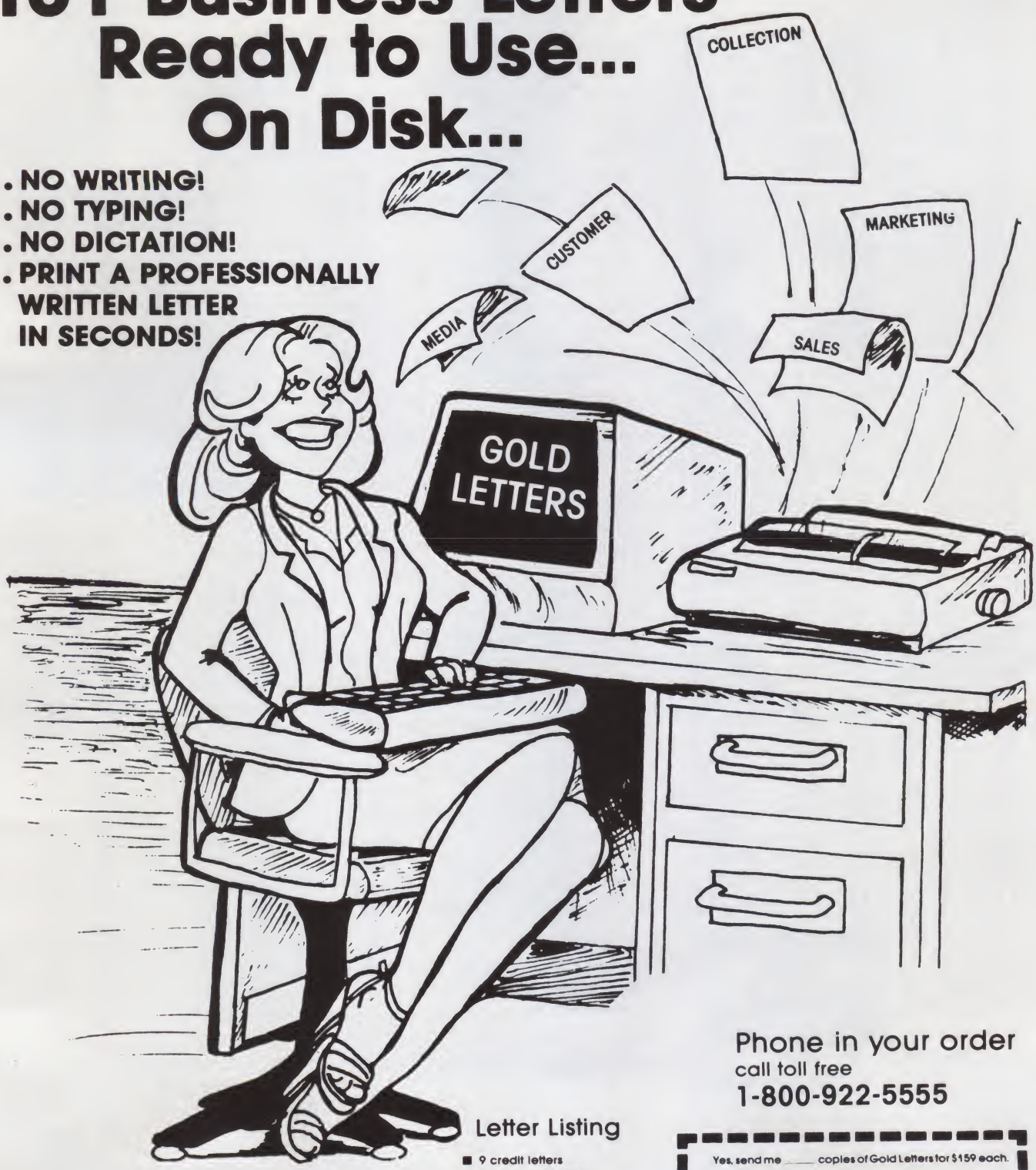


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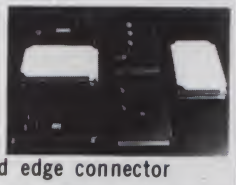


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Mate V paints the screen is another of its advantages.

This speed is attributable to several factors. The computer uses a separate NEC 7220 graphics microprocessor chip and dedicated graphics memory, so its CPU is not slowed by graphics housekeeping. The separate graphics memory, 32K in monochrome mode and 96K in color, stores the bit-map screen image without costing the user any available program memory.

With the high resolution provided by the Decision Mate, half of user RAM in a 64K machine would be consumed by graphics routines if a separate memory were not used. The combination pays off both in high-resolution and fast-moving graphics.

High-resolution graphics, of course, translates into more information on the screen, presented in a form that is easier for the user to understand. Smaller characters make it possible to label charts and graphs in a more detailed manner than if only the 80×24 screen configuration were used. Better distinctions can be drawn between different elements of a graphics display as well. A bar chart can contain not only simple bars, but ones that have been shaded, cross-hatched or marked to distinguish them from others on the screen at the same time.

High-resolution graphics also can display finer gradations of information than systems using larger pixels. The data can be presented more accurately. "Stair-stepping" of diagonal lines won't be mistaken for uneven graph curves, for example.

Configurations

The Decision Mate V personal computer can be configured either as an eight-bit device, using a Zilog Z-80A, or as a dual processor computer, with a 16-bit Intel 8088 added. The popular CP/M-80 operating system is available for eight-bit applications, while the 16-bit user has a choice of CP/M-86 or MS DOS.

Only two cords are needed to set up the Decision Mate. A keyboard cable connects the detached keyboard to the CPU/monitor, which contains either two 5¼-inch drives with up to 360K of storage each or one 5¼-inch drive with a ten-megabyte Winchester hard disk. The second cord is an ac power cord.

The Decision Mate V includes all of the necessary graphics boards and extra memory as purchased. There is no need to open the computer case and upgrade should graphics be desired.

A seven-slot bus on the back of the computer accepts all of the peripheral adapters required to expand memory from the stock 64K up to 512K. You can even begin with an eight-bit version and upgrade to a 16-bit operation simply by plugging an adapter into one of the slots. One of the seven slots is designated for a diagnostics module, while a second is reserved for memory expansion.

Hardware Features

Other hardware features of the machine also make it suitable for graphics. A joystick port in the keyboard can be used, with the proper applications packages, to manipulate a cursor and graphics characters on the screen. Graphics tablets, light pens and other peripherals can also be plugged into this port or into the computer's RS-232C serial interface adapter.

Graphics applications software that makes use of the machine's NEC 7220 GWBasic, a low-cost ($60) programming language, is available. GWBasic has software support for graphics and standard Basic features and a variety of preprogrammed call routines. A zoom routine, for example, lets you instantly increase the size of a circle.

This language is available only with the 16-bit processor and operates under MS DOS. GSS Graph is a utility program that accepts user input of numbers and develops representative pie charts, bar graphs and other graphics automatically. These software packages allow you to use the same applications programs for viewing graphics on the screen or directing to a plotter or bit-mapped printer for hard copy output.

Graphics provides a way of condensing many numbers into an easily visualized and interpreted form. Bar graphs and pie charts make it simple to compare one group of numbers with another and to see how one parameter affects another. Sales versus advertising dollars spent by media, research and development costs compared to manufacturing costs, and inventory levels as they affect service can all be portrayed simply with graphics.

In the future, powerful desktop tools like the Decision Mate V will bring these graphics capabilities to more users.■



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For scintillating hi-res color graphics, try Telidon.

What high-resolution color graphics subsystem connects easily onto micros, minis and mainframes alike, can operate semi-independently from its host, can be used with little or no training and was invented by the Canadian government?

Why have AT&T, Time, Inc., DEC, Sony and others announced formal adoption of Telidon as the North American Presentation-Level Protocol Syntax (NAPLPS)?

What Is NAPLPS?

NAPLPS (pronounced nap-lips) represents a breakthrough in graphics standards. It is a shorthand binary language for encoding graphics images.

It also sets standards that manufacturers of graphics decoders must adhere to in order to maintain compatibility across the technological gulfs of resolution, color generation, text fonts, blinking attributes and other potential variances that generally force graphics applications to be machine-specific. With NAPLPS, compatibility is the key.

Originally derived as a form of videotex (graphics-enhanced telecommunications), Telidon has evolved into the NAPLPS graphics language. NAPLPS was designed to allow digital communication of graphics information over telephone lines or other low-band-width channels. NAPLPS provides methods of compressing images into short blocks of digital information using picture-description instructions (PDI). PDIs are used to express the geometric properties of an image.

NAPLPS is efficient when it comes to storing graphics codes. Where a screen might represent 24K of display memory, the list of single-byte commands to the decoder might be only about 1K long. This makes NAPLPS well-suited to videotex applications.

NAPLPS is inherently resolution-independent; in other words, it does not require a specific pixel count to operate. The NAPLPS standard allows for more than 512 different colors and supports more than 20 graphics primitives. The syntax also supports definable macros, built-in scaling, definable brush width (line thickness), downloadable character sets, bit-mapping and, to maintain compatibility with other forms of videotex, alpha-mosaic (character-oriented) display techniques.

Implementation Requirements

Although NAPLPS can be implemented on a microcomputer using software only, ideal configurations use a combination of both hardware and software. Telidon decoder terminals are available in a variety of shapes, configurations and prices, from such manufacturers as Electroholme, Rolm, Northern Telecom, Microtel, Norpak and Sony.

Some devices are integrated with



D O N

By Jerry R. Waese and Jim Heid, *Microcomputing* Technical Editor

RGB monitors; others are designed to fit into common TV sets. The future will bring decoders built into cable converters as well as microcomputers with decoders included as standard equipment.

Norpak is the only manufacturer currently producing an off-the-shelf microcomputer with NAPLPS capability built in. Its 6809-based GC-1000 provides a resolution of 256×200 pixels and can receive and display NAPLPS information. It also can be used in a stand-alone mode to generate frames.

Apple is marketing a Telidon card for the Apple II. The Apple II Telidon Graphics System consists of an interface card containing a 6809 microprocessor and serial connector, a disk containing graphics system software and a reference book. The system runs on a 48K Apple II or Apple II Plus with one disk drive and DOS 3.3.

Because Apple's Telidon card uses Apple II display routines, however, it does not provide full implementation of NAPLPS.

Possible Applications

For the most part, Telidon has been touted as a two-way video trick for buying products and reading the news without leaving your living room. Although this technology is operating in some areas, it is only one of many possible applications of the invention.

Telidon has many applications in the broadcasting industry. Some cable TV companies are using it to create colorful, sometimes animated graphics screens that make their text and community-service channels much more interesting to watch.

A commercial television station in Toronto, for instance, uses a large, Telidon-generated weather map in place of a conventional map.

Telidon can also be used to produce logos and animated graphics sequences for commercials.

The military was first to catch on to the importance of NAPLPS (even before the standards were set). One can only speculate that, using Telidon, the military is building elaborate combat simulators that can be monitored by instructors at a remote station.

Besides simulations, real-time telemetry can be displayed in a variety of formats, screen locations and colors to enhance performance in combat or on the moon.

Limicon's Offerings

Limicon, Inc., focuses on business graphics as well as computer art applications of Telidon. Telecalc II takes

Jerry R. Waese, 512 King St. E., Third Floor, Toronto, Ontario, M5A 1M1, Canada, is an employee at Limicon, Inc., Videotex Graphics.



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raw VisiCalc or SuperCalc serial files (/pf- or /pd-generated data files) and automatically creates NAPLPS-coded charts and graphics. Telecalc II accepts up to 21 columns by 16 rows of data, with all titles and column and row labels embedded in the VisiCalc data.

Unlike other programs that generate graphics from VisiCalc data, Telecalc II doesn't need precompiled files; it automatically generates a chart, in color, after simply being told the name of a data file.

All fields are sized and positioned to best use the Telidon screen. Only when generating pie charts does the program require additional user input (to determine which slices to explode), and even these prompts require simple one-key answers. Within two minutes, the finished chart is displayed and the NAPLPS code is ready to store.

By pressing the return key, you can rotate the default color pallet through 96 permutations to select the most appropriate colors for your presentation. Storing the finished graph is as easy as typing a suitable name when prompted.

Telecalc II comes with page-creation utilities that you can use to edit charts and graphs, add logos, create text pages or create art. The page-creation utilities aren't hard to use, but they do require some practice and forethought.

After you've created and edited a number of graphics pages, Telecalc II's slide show routines can be brought into play. They let you set up an index file that stores the name and timing intervals for each "slide." The slides can then be displayed sequentially or randomly simply by typing the name of the appropriate index file.

The "slide show" terminology is a bit misleading in that a Telidon screen need not necessarily be cleared before displaying the next slide. Indeed, much of the fascination in this method of presentation is in the way a Telidon picture can be built by artistic overlapping of colored forms and text. A series of Telidon pages can be designed as stepped additions to a developing scene or graphics concept.

Lastly, because most of the Telecalc II software is written in Basic, it can be customized. In a computer-assisted instruction application, for example, the software can be altered to display certain slides at certain times, depending on student response.

The Telecalc II graphics presentation system combines the Telecalc software with the Norpak MK IV videotex decoder to make a complete graphics-development system for less than $1400.

The Future

In the works at Limicon are an interior designer's toolkit, a resolution-free drafting system for engineers and architects and software to permit interactive, real-time game playing—in color, over the telephone and between different brands of equipment.

NAPLPS can, and should, be in the hands of the populace to best vitalize the medium. There are thousands of microcomputer users who can and are willing to participate in this new technology and to partake of its fruits.■



What a CAD!

Robographics computer-aided drafting system (CAD-1) offers drafting features previously associated only with minicomputers and mainframes.

By Allan H. Schmidt

Computer-aided drafting (CAD) is one of the most widely used applications of computer graphics today. Until recently the cost of such systems has been more than $100,000. These systems have increased the productivity of draftsmen and engineers so significantly that in large firms they often have paid for themselves within a year.

The benefits that a CAD system provides for working with graphics data are analogous to those that a word processor offers when working with text or a spreadsheet with numbers; work can be completed more quickly and flexibly with an associated increase in the quality of the final product.

One of the major benefits of industrial CAD systems is that they eliminate the need to completely recreate a drawing when major changes are introduced. With CAD, as with word processing, it's possible to "cut and paste" information from one drawing to another and to experiment with the creation of alternate graphics in less time than required for the manual creation of a single drawing. Standardization of drawings has also resulted from the increased discipline of work methods associated with any computer application.



The Robographics CAD-1 Computer-Aided Design System.

Enter Robographics

Robographics CAD-1 is one of several recently announced microcomputer-based CAD systems. CAD-1 offers a number of capabilities required for computer-aided drafting, although on a more limited scale than is expected on a minicomputer or mainframe-based system. Graphics data is input by use of the Robographics handheld graphics controller and displayed on an Apple monitor. The system also includes interfaces to other graphics input devices (electronic digitizers) as well as to pen plotters (see Photo 1).

As you create a drawing with CAD-1, the system records a list of x,y coordinates describing the lines and symbols that make up the drawing. That data is used to compute a "bit map," which is displayed as an image on the screen. The bit map is actually a grid of picture cells (pixels), each of which is on (light) or off (dark).

The screen image may be saved on disk for future display, modification or printing with a dot matrix printer. Resolution of the display screen as well as the corresponding image produced on a dot matrix printer is limited to 256 columns by 192 rows. Actually, there are 280 columns, but 24

Address correspondence to Allan H. Schmidt, 199 Cambridge Turnpike, Concord, MA 01742.

are used for CAD-1 menus.

The list of x,y coordinates initially recorded by the system may also be saved on disk. These coordinates contain the full six-digit precision for the x and y coordinates of each point used to define the vertices that make up the lines and symbols in a picture. The storage space required for saving a typical picture as a list of x,y coordinates is normally much less than that required for a bit map of the entire screen.

By sending the coordinate list to a pen plotter, you can create drawings with a resolution to 0.001, depending on the plotter, containing far more detail than the Apple screen can display. A diagonal line displayed on a screen might look a little like a staircase; no such effect is created by the pen plotter, however, because it's drawing a continuous line between discrete points.

Because CAD-1 stores a picture as both a bit map image and a list of x,y coordinates, it allows you initially to create a precise x,y coordinate database. You can view that data as a relatively low-resolution image on the Apple screen, print the picture on a dot matrix printer or draw it in full detail on a pen plotter. Because of the accuracy of the x,y coordinate list, you can zoom in on any portion of the graphics database and have it effectively magnified on the screen in order to see or add detail that isn't visible at full scale on the Apple's monitor.

Screen image data files may be recalled and modified by adding additional data or by removing data by tracing over any existing line with a black line. Since most drawings appear on the screen as white or colored lines against a black background, an existing line can be hidden by tracing over it with a black line. Since you're working with an image on the screen rather than the x,y coordinate list, however, operations such as Zoom, Pan, Rotate, Scale, Stretch, Flip and other list-dependent functions don't work.

To retrieve a drawing, just point at the desired picture with a joystick.

What You Can Do

When you work with pictures saved as a list of x,y coordinates you can add to them, selectively erase parts of them (line by line) and use the Zoom, Pan, Rotate, Scale, Stretch, Flip and Paint options as well as any other operation available when creating a new picture.

When you boot the CAD-1 system, a menu appears offering the following options:

1—Run graphics program
2—Format library disk
3—Format archive disk
4—Format buffer disk
5—Set up controller
6—Set up printer
7—Set up digitizer
8—Exit

The library disk contains pictures provided by Robographics as samples that can be displayed and manipulated. Several of these pictures are referred to in the tutorial provided in the user's manual. Space is also available on the disk to store your images. File directories for cataloged drawings are shown as a matrix of miniature pictures. You retrieve a drawing by pointing at a desired picture with a joystick. Additional library disks containing symbols used for specific types of drawings are available from Robographics. You can also create an archive disk to provide additional storage space for saving pictures.

A buffer disk is required by the system when you run the program. This provides additional memory work space. The buffer disk, together with the second disk drive, can be replaced by a 128K memory card configured as a disk emulator. This functions much faster than a disk drive, virtually eliminating delays in data transfer to and from the buffer.

Plug It In an Apple

Setting up the graphics controller involves plugging it into the Apple's 16-pin game I/O port and then adjusting six potentiometers on the bottom of the controller. Well-designed graphics screens are provided to guide you through each alteration.

Printer setup involves telling the software which matrix printer graphics interface card is installed in your computer. Setting up the digitizer similarly involves specifying which manufacturer's device is being used. Plotter setup requires installation of a separate asynchronous serial interface card, which comes with the Robographics pen plotter. A floppy disk is provided that contains the driver software for use with a specific plotter.

Selecting menu option 1, Run graphics program, causes the system to load the graphics software. You then remove the system disk and replace it with the library disk in Drive 1. A formatted buffer disk is inserted into Drive 2.

The next display that appears is shown in Fig. 1. It contains a menu of

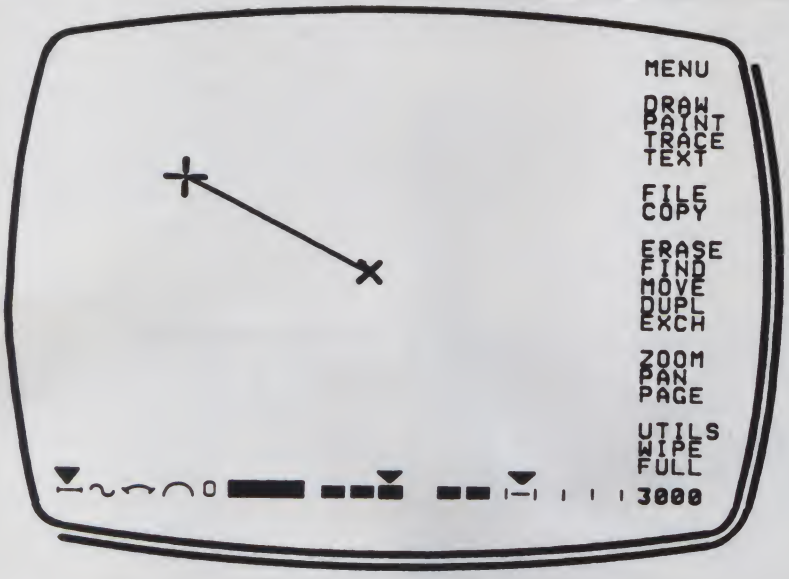


Fig. 1. The Robographics commands, pallette of graphics symbols and cursor.

commands along the right edge and a palette of graphics symbols along the bottom. The remainder of the screen is referred to as a "work page," which is the drawing area for the picture you are creating. The work page contains a graphics cursor that you manipulate with the handheld graphics controller.

This device contains five controls: a joystick for positioning the cursor, a control disk for changing the size and orientation for the cursor and three function buttons for selecting and executing specific operations. The keyboard isn't used except for the occasional entry of numeric values or text labels.

Cursing

The cursor initially appears as a line that can be manipulated like a rubber band. The end marked with an X can be fixed on the screen while the other end, marked with a plus sign, is moved around the screen. To select a particular operation from the menu, move the plus sign to the name of the operation and then press a function key to confirm selection. Then press another function key to begin the operation.

The default mode, called Draw, lets you construct figures composed of straight, curved or circular lines. You select the specific line type from the palette at the bottom of the screen, and the cursor changes shape to reflect the type of line currently being drawn.

Using the Draw command, a figure composed of a series of straight lines may be defined by positioning the X cursor with the joystick. Indicate the position for each of the subsequent vertices by moving the plus end of the cursor to each vertex location and pressing a function key. The result is similar to what would be achieved by drawing with a straight-edge drafting tool.

Curved lines may be constructed automatically by using tangent arcs or compass arcs. Tangent arcs are arcs of a circle whose first point and starting direction are based on a straight line connecting the last two points drawn. The radius of the arc is controlled by use of the joystick, which locates the ending point of the arc. The process is somewhat like using a French curve to draw a curved line.

Compass arcs allow you to define the center point of an arc and to fix its radius, again by using two function keys and the joystick. The result is similar to arcs drawn with a compass.

Circles are drawn by using the joystick to locate a center point and then rotating the control disk to vary the radius of the circle. You then press a function key to draw the circle at the size and location indicated. Additional circles are drawn by repositioning the center of the circular cursor and/or changing the cursor size with the control disk and then pressing the function key once for each new circle. It's like using a circular rubber stamp of variable size. Circles can also be stretched and rotated to construct ellipses.

As a sketching and drawing aid, the system is quite versatile and easy to use. As a precision drafting tool, the system has many capabilities.

Drawings normally appear on the screen as white lines on a black background. Other line colors, including purple, blue, green and orange, can be selected from the Draw palette at any time. Lines are normally solid but you can also choose dotted lines with three different dot spacings. Although only one line weight for solid lines is available, there's the capability to draw with a nib. This produces a variable stripe line, much like a straight stroke with a flat brush having a tip that can be varied in width and rotated during each stroke.

The resulting graphics include rectangles, trapezoids, triangles and twisted ribbons. The starting and ending position of each nib stroke is determined by use of the joystick and two function buttons. Stroke width is varied by rotating the control disk. The areas created by each nib stroke may be filled with any of five different line spacings or a solid fill.

Freehand Freedoms

In addition to drawing straight lines between selected points, circles, arcs and nibs, freehand drawing also is possible with CAD-1 using the Trace mode. Freehand drawings are constructed using either the joystick or a digitizer tablet.

Positioning the X cursor at an initial point, pressing and holding a function button and freely moving the joystick produces a continuous line on the screen. The same operation can then be repeated from another starting location. The effect is one of freehand sketching with solid or dotted lines of varying color. The user's manual suggests that preexisting artwork on transparent paper or film can be taped to the screen and then "traced" using this technique.

Freehand movement of the joystick in Trace mode is difficult to control if you want precise drawings. But freehand sketching is still quite possible and can be enjoyable in this mode.

You can also use a digitizer in Trace mode. Point-to-point definition of lines is also possible. Point-to-point operations are similar in their effect to straight lines created in the Draw mode with the joystick except that you use controls on the digitizer tablet (function buttons, pointer and pointer button) rather than the handheld graphics controller and joystick. For accurate tracing of many drawings, the digitizer tablet is easier to use than the alternative transparent drawing taped to the screen.

Text mode lets you enter alphanumeric strings, such as labels, dimensions and notes, at any location on a drawing directly from the keyboard or from a library disk of symbols.

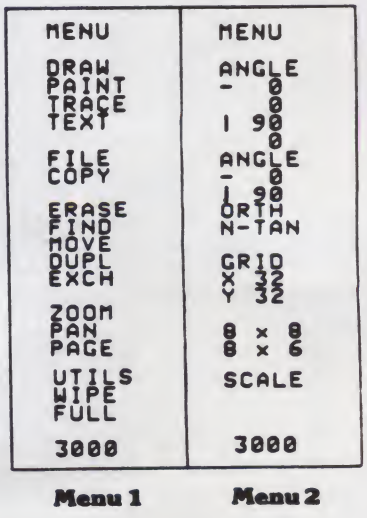


Fig. 2. An additional menu of commands is provided for precision drafting operations.

Keyboard entry provides for five sizes of text in any of four orientations: horizontal, and in 90 degree increments.

Greater flexibility of text size, rotation and proportion is achieved by using blocks of text that are first stored on a library disk and then recalled for placement on the drawing. In this manner, size, rotation and proportion of the text are continuously and independently variable, which allows complete freedom of construction and placement.

Zoom and Pan modes allow you to magnify a screen image by graphically framing any part of the work space and then having it redrawn at full screen size. You can repeat this operation to achieve any degree of magnification. Once magnified, the image can be panned in a stepwise fashion to examine parts that may have moved off the screen as a result of magnification. This feature is valuable for adding or examining detail within a drawing. Such detail may not be visible on the Apple's screen at full scale but is contained in a drawing produced with a pen plotter.

One of the most difficult jobs in drawing is ensuring that lines that are supposed to meet at a point actually do so without gaps or overshoots. CAD-1 has an automatic Find mode you can use to locate the start of new lines at any previously drawn point.

Precision Assistance

CAD-1 offers features specifically intended to assist the user in carrying out precision drafting operations. A separate menu of commands (Fig. 2) is available to supplement the basic drawing operations described above. Precision drafting operations make particular use of lock functions and scale grids.

Lock functions restrict movement of the screen cursor to specific paths or steps and serve the function of a T-square and angle ruler. There are two general types of locks: angle and grid. Each has a wide range of possible settings and can be used separately or together.

The scale grid mode allows the user to assign a specific interpretation to a grid, such as $\frac{1}{10}$ of an inch per grid line. Objects with known dimensions may then be drawn to scale.

Angle locks for the x and y axes may be specified in terms of 90 degree orthogonal increments, 0–360 integer degrees or in terms of degrees and minutes for even greater precision. A normal tangent lock is also available that automatically senses the slope of the last line drawn and then sets an orthogonal axis lock at the end of the line. This is used to smoothly blend curves into straight lines, much as the TAN ARC function from Menu 1 blends straight lines into arcs.

With a grid lock in effect, the cursor can move only to points coinciding with grid intersections currently shown on the work space. You can set any grid size in the range from 4–32 pixels per grid division. This results in grids ranging in size (columns and rows) from 8×6 to 64×48.

Grids can be rotated to any desired angle or aligned with any previously drawn line. You can specify skewed grids with x and y axes at chosen angles, thereby establishing isometric grids for use in constructing isometric drawings.

CAD-1 is a versatile computer-aided drawing system. It offers numerous drawing aids in the construction of lines, circles and arcs of various sizes.

Scaling the Heights

The Scale mode of CAD-1 allows you to set a locked grid of specific dimensions and to draw on this grid using all the techniques described above. The implicit size of a full page can be set to any value in both English and metric dimensions: 1–9999 feet, 1–999 inches, 1–999mm, or 1–999 km. The work page then displays a locked grid with the nearest larger base page that gives a convenient grid spacing.

Three values appear in a "scale palette" at the top of the screen: the chosen size of the base page, the size of the view currently displayed (which is the same as the base page until you zoom), and the size of each grid space. This last value also changes as you zoom. For example, if the base page is dimensioned in inches, you can zoom to give a space of 0.0001 inches; with dimensions in feet the minimum grid space is 0.001 feet.

Having selected a scale appropriate to the real dimensions of the subject to be drawn, the next step is to draw the subject at 1:1 scale. The subject's "real" dimensions are transferred onto the screen using the scaled grid as a measuring rule for the drawing.

When the Zoom function magnifies selected areas of the drawing, the system automatically rescales the screen grid with progressively finer divisions as the degree of magnification is increased. This allows you to draw to any desired level of detail and precision.

When you save a picture on the library disk, true scale is maintained. CAD-1 pen plotter software allows a drawing initially created in Scale mode to be plotted to any scale from 1:1 up to 1:9999 or down to 9999:1.

Dos and Don'ts

All drawing measurements must be computed visually. A line to be constructed to a specific size must be located by counting the grid points shown while mentally multiplying by the value-per-grid unit displayed for the grid currently in use.

It isn't possible to draw a line and have the system compute and display its length or its x,y coordinate values. Nor is the provision made for determining the x,y coordinate values defining the work space. It also isn't possible to have a line constructed automatically to a specific length from a given point.

Precisely located and measured lines can be constructed manually, but only by visually counting grid marks and repeatedly zooming in on the end point for the stepwise addition of line increments of increasing precision.

When you select the scale mode, the system asks you to specify feet, inches, millimeters, meters or kilometers as your units of measure and displays the specified units of measure as labels on the screen for your use in mentally computing distance on the grid.

When the drawing is produced on a pen plotter, it's possible to introduce a conversion factor to achieve any desired scale on the plot, such as $^{1}\!/_{16}$ = 1'–0". Appropriate conversion factors are included in the appendix of the user manual.

The CAD-1 user manual consists of a padded three-ring binder, which

contains 165 pages and 250 illustrations. It serves as a combined tutorial and reference manual with three major sections: "Getting Started," "Basic Drawing" and "Precision Drawing."

Commands are described in detail. Sample exercises are included that first-time users are encouraged to work through. Each command has one or more illustrations of the exercise results.

There is no index, but the detailed tables of contents, which precede each section, reduce the need for an index once you have read through the manual.

The CAD-1 system works as described in the user manual. The program is reliable and tolerant of incorrect commands or data.

CAD-1 software, graphics controller and user manual are priced at $1095. Additional symbol libraries for use with architectural, chemical, electrical and alphabetic (sign) drawings are available from Robographics at $125 each. A plug-in board for the Apple that allows 1K by 1K screen resolution is reported to be under development.

CAD-1 requires an Apple II or IIe with 64K RAM and suitable video display, such as a color monitor, and two Apple II 16-sector disk drives. Any one of several different manufacturer's dot matrix printers with graphic screen printing capability can be used to produce hard copy of screen images.

Options from Robographics include two sizes of plotters up to 22 ×34 (Houston Instrument DMP-40 or 41) and an 11×11 digitizing tablet (Houston Instrument Hi-Pad). Other manufacturers' plotters also are supported. An IBM PC version of the program will be released in the future.

Wrapping It Up . . .

CAD-1 is a versatile computer-aided drawing system. The system offers numerous drawing aids to assist in the construction of straight, angled and curved lines, circles and arcs of various sizes and predefined symbols. Drawings can be scaled and oriented with great flexibility. Graphic objects can be repeated on a drawing, closed areas can be color-filled and drawings can be selectively edited and modified.

As a sketching and drawing aid, the system is quite versatile and easy to use. As a precision drafting tool, the system has many capabilities. However, it lacks the ability to construct lines of specified dimension automatically or to measure the length or relative position of a line as drawn. These operations can be performed manually but depend upon visual inspection and counting of grid marks at various scales. The effort required and potential for human error limit the productive capability of CAD-1 for serious drafting operations involving many drawings.

The system is very good for demonstrating CAD principles and operations for which significant production volumes aren't required, as in an educational setting. An Apple monitor provides adequate resolution for constructing drawings, which are subsequently produced as draft copies with a dot matrix printer or with a high degree of precision using a pen plotter (Fig. 3).

CAD-1 was developed by Robocom, Ltd., a software firm located in the U.K. Originally marketed in Europe as "Bitstick," the software has been renamed Robographics CAD-1 and is distributed in the U.S. by the Chessell Robocom Corp., 125 Pheasant Run, Suite 2B, Newton, PA 18950.■

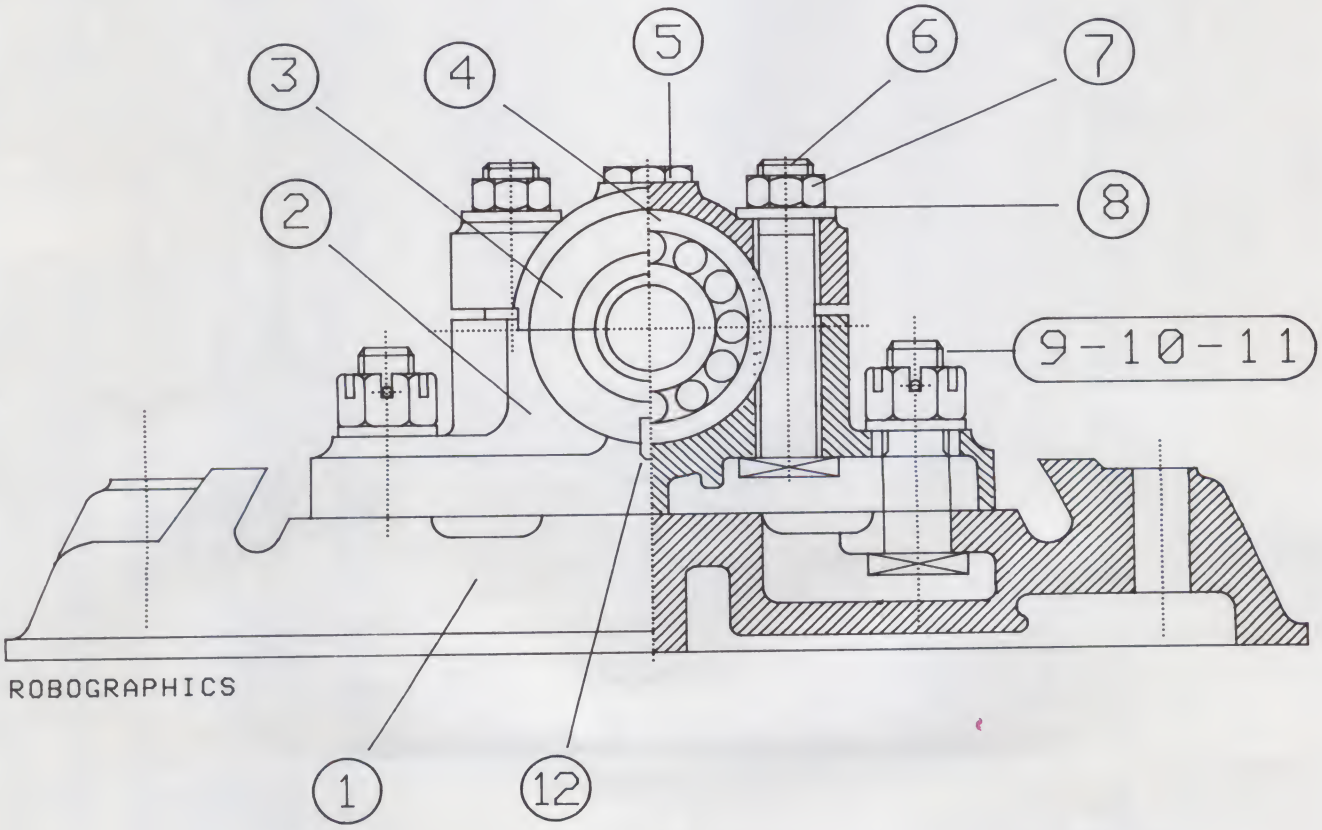


Fig. 3. An example of what can be drawn and plotted with the Robographics CAD-1 Drafting System.

To Market, To Market . . .

Playing the market can be fun, but if you're making major investments, you need to know the ins and outs of the game. Why not let your micro help out? With the right software, portfolio management can be more manageable.

By Anne Coda



Playing the market can be exciting and profitable, but for the serious investor the stock market and other securities markets are no game. Calculated decisions to buy and sell securities are made after reviewing information about market conditions and the issue in question. Until now, most of these calculations were performed by consultants or by those few private investors with enough training and, perhaps more importantly, enough time to do the job thoroughly. But with the introduction of the microcomputer, this has all changed—your own computer can handle all the calculations and more.

With portfolio management software, you can now let your computer do the walking through all the research material contained in various databases, including the Dow Jones News/Retrieval Service. Your computer can update stock prices, tell you when to buy or sell, and even tell you how much commission you have to pay your broker.

The basis of all securities software packages is your personal securities portfolio, a listing of all your stocks, bonds, rights, options, mutual funds, and so on. You then log into the portfolio management software a host of information about each security, including the price at which you bought it, the trading symbol and other data required by a particular software package.

Do you really need a portfolio management system? The answer depends on the size of your portfolio and your desire to actively participate in keeping track of your issues and market conditions. If your portfolio contains several securities of various types, you should seriously consider putting your micro to work for you. Keeping track of each issue on a daily basis without its help can be time-consuming, and missing important data may mean a costly mistake.

Not a Miracle Worker

Before examining what a good portfolio management package should do, it is important to understand what it cannot do. Portfolio management software cannot turn your computer into a crystal ball that will predict winning stocks with constant accuracy. Beware of software publishers who claim that their programs will make you rich; chances are that the publisher will be the only one to realize the claim.

Many packages on the market fall under the heading "portfolio management," but not all of them offer the same capabilities. Some are designed to act as electronic filing systems,



while others actually make guesses about future stock prices.

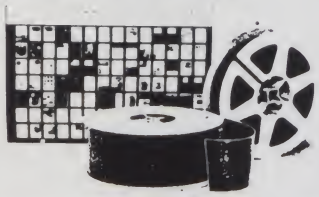
Before you purchase a portfolio management package, take a personal inventory of your portfolio. You will need to know the number of types of securities you own, and you should have an idea of what management capabilities you need personally. You might easily purchase an expensive program that produces more technical information than you can use.

Your computer combined with a good portfolio management software package appears to be a dream come true for any serious investor, but it still has pitfalls that you must be careful to avoid.

Do not put absolute faith and trust in the computer and software. When you see information on your screen, you might easily assume that it is error-free because it is based on a direct link with Dow Jones. This may not be the case; although the software manufacturer and the database service have made every effort to provide accurate data, the result should be considered

Anne Coda (121 Gordon St., Ridgefield, NJ 07660) is a financial consultant and freelance writer whose articles have been published in a number of computer magazines.

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as just one piece of data that must be combined with other information—including common sense—to give you the basis for reaching a decision.

Some programs actually attempt to predict future market conditions and stock prices. Be aware that these are only statistical estimates based on historical relationships of various data, and even the educated guess is sometimes wrong.

Treat the results of the portfolio management software package as you would any other sort of advice. Always check the information against other sources before making a major financial move. Acting on data generated by a single software package can produce a less-than-desirable outcome.

Common Functions And Special Extras

A good portfolio management system should be able to handle the recording of your securities transactions. After you enter certain data, the software should calculate various types of information and produce a report listing price bought, price sold, broker's commission, cost of the transaction, net gain or loss in dollar amount and percentage, breakdown by shares, total amount per issue, capital gains and amount of money remaining to reinvest after taxes.

With this information at hand, you can quickly review your portfolio and know where you stand before and after a transaction. It is also desirable to have software with the ability to play the "what if" game, an activity performed by professional investors every day. Given the condition of your portfolio, you are able to project the effect changes in various conditions would have on your portfolio—selling an issue ten points higher than the existing price or 20 points lower, for example.

Software having this capability permits you to alter almost any piece of data affecting your portfolio and see the impact within seconds. You should be able to perform the "what if" exercise without losing or changing the computerized record of your portfolio.

A feature offered by some portfolio management systems is automatic updating of information used by the software. To take advantage of this facility, you need a modem and a subscription to one of the several databases available, such as Dow Jones. (In addition to the subscription fee, you will pay an hourly charge for connect time, the rate depending on the time of day you use the service; prices are higher when the securities markets are open and lower during off hours.) The auto-update capability probes the database and adjusts the information in your portfolio management software to reflect the latest condition of securities markets—current selling prices of issues in your portfolio, for example. You do not have to sift through the listing of stocks and bonds in the newspaper; simply ask your computer to call the remote database for the latest information.

The portfolio management system you buy should be able to perform the more common data manipulations usually handled by a securities consultant, including trend analysis, balance of your portfolio between stocks and bonds, high/low/average prices, average cost of a share and other general statistical profiles of your issue and your portfolio.

Some packages extend this manipulation to include analyses of market conditions using information from a remote database. Another feature available with certain programs is the ability to receive raw data about a particular corporation, perform various analyses on them and generate a report that gives you a statistical look at the corporation.

Depending on the software you purchase, you can have at your fingertips complete statistical breakdowns of your portfolio, of market conditions, and of an individual issue and corporation. What you do with this information is another problem. Few programs go out on a limb to tell you which stocks to buy or sell. In most cases you or your advisor will have to make that determination based on the information supplied by your computer.

It is important that you have a clear picture of the condition of your portfolio and any other data provided by the package you use. Before you purchase a portfolio management package, you should be sure that it is capable of creating clearly structured reports, charts and graphs, the most comprehensible method of communicating this type of information. Check to see if the output can be printed, as you may find hard copy easier to use for discussions or financial records. Color displays also enhance the clarity of the data.

A Portfolio Management Sampler

Many software packages are available to help manage your securities and investments portfolio. Here are a few of the more widely known programs.

Market Manager
Dow Jones & Company
22 Cortland St.
New York, NY 10007
$299

Trendex
Radio Shack
1300 One Tandy Center
Fort Worth, TX 76102
$59.95

The Computing Investor
The Computing Investor
29-A Estancia Drive
Marana, AZ 85238
$199

Stock Portfolio System
Smith Micro Software
P.O. Box 604
Sunset Beach, CA 90742
$185

Portfolio Master
Investors Software
48 Iron Ship Plaza
San Francisco, CA 94111
$195

Watch the Red Flag

If you have a selection of issues in your portfolio, you will probably find a "red flag" feature quite useful. It causes your computer to highlight conditions in your portfolio that require your immediate attention, as when a stock price falls close to a predetermined dollar amount. You can then check the facts of the situation and take the appropriate action.

Red flags are user-defined and/or set by the program manufacturer, depending on which package you purchase. The flags you set usually involve areas of strategy, such as when to sell a stock. Manufacturers' flags are usually based on a rule of thumb for the industry, such as a portfolio's margin condition. If you purchased a stock on margin, for example, the flag would be raised if the margin becomes too high by industry standards.

A good portfolio management package should be able to handle a variety of securities, not just stocks and bonds. It should deal with taxable and nontaxable bonds, options, warrants, rights, T-bills, puts and calls, mutual funds and common and preferred stocks.

A software package that cannot accommodate various kinds of securities limits your ability to use your desktop computer in the management of your complete portfolio. Check the documentation of any program before you buy to be sure that it covers all the securities you need.

Documentation is a serious consideration when deciding on any type of software. Regardless of how well a program performs, you will be in trouble if you do not fully understand how to use it. If you cannot follow the instructions, do not buy the package; even a good piece of software is useless without adequate documentation.

A few programs give you more than you might expect from portfolio management software, such as preparation of the information you need for Schedule D in your federal income tax return. At tax time, a report is produced that summarizes your transactions during the year and can be turned over to your accountant. You do not have to go through an entire 12 months' worth of data in one session at the end of a year—your microcomputer does it for you.

A portfolio management software package can open up a whole new adventure in buying and selling securities. With the right program, you can sit back and experiment. You can observe the effect on your portfolio of the hypothetical rise and fall of stock prices and, by playing "what if," set a goal for selling an issue before you lose too much money.

As long as you double-check responses given by the program against other sources (brokerage firms, financial newspapers and your own common sense) before making major decisions, the software teamed with your computer can provide you with a valuable investment tool. And consult your accountant—both the software and your computer may be considered tax deductions. (See "Desktop Deductions" in the October '83 issue of *Desktop Computing*.)

Now if we could only find software that would predict with total accuracy which stocks and bonds to buy . . . if you hear of one, let me know.■

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Playing Games With Apple Pascal

A fun graphics game written in a high-level language? Impossible, you say. Read on and discover how this Apple Pascal game was born.

By Robert Hurt

It's annoying for a programmer to have access to a good programming language but not be able to use it because of a single irritating shortcoming. Take, for example, programming a fast-moving graphics game in Pascal. Everyone knows that fast graphics and high-level languages go together like mustard and strawberries (at least when you're using micros with 1 Mhz clocks). But after you use a structured language like Pascal, it's really hard to give it up and go back to assembly programming.

But what do you do about it? Compromise, naturally. If you cannot adapt the language to the programming task, try adapting the task to the language. I had a long-standing desire to write a fun graphics game for my Apple, but if I wanted high-level convenience I had to sacrifice elegant graphics displays. But with the right sort of game, perhaps I could get the speed I desired without writing a byte of assembly code. This is how my program LightTrace was born.

Listing 1. LightTrace—a fast two-player graphics game written in Apple Pascal 1.1.

```
PROGRAM LIGHTTRACE;
USES APPLESTUFF,TURTLEGRAPHICS;

(*************************************************************************)
(*                                                                       *)
(*                              LIGHTTRACE                               *)
(*                                                                       *)
(*                            ROBERT L. HURT                             *)
(*                                                                       *)
(*                              7/18/83                                  *)
(*                                                                       *)
(*   LIGHTTRACE IS A FAST-PACED TWO PLAYER GRAPHICS GAME WRITTEN IN      *)
(*   APPLE PASCAL 1.1.                                                   *)
(*                                                                       *)
(*************************************************************************)

VAR X1,Y1,X2,Y2.           (* LOCATION OF LIGHTTRACES *)
      ANG1,ANG2,           (* HEADINGS OF LIGHTTRACES *)
            SPD,           (* SPEED FACTOR *)
              I,           (* INDEX VAR *)
          COLL: INTEGER;   (* COLLISION FLAG *)
         DUMMY: CHAR;      (* DUMMY CHARACTER *)
  BSCORE,OSCORE: INTEGER;  (* PLAYER SCORES *)


(*$I-*)
PROCEDURE READI(VAR I:INTEGER);
(*                                                                       *)
(*    CRASH-PROOF ROUTINE TO INPUT AN INTEGER                            *)
(*                                                                       *)

VAR DUMMY: CHAR;

BEGIN
  READ(I);
  READ(DUMMY);
  WHILE (IORESULT > 0) OR (DUMMY <> ' ') DO BEGIN
    WRITELN;
    WRITE(CHR(7),'BAD FORMAT-REENTER: ');
    READ(I);
    READ(DUMMY)
  END
END;
```

More

What Is LightTrace?

LightTrace is a two-player action game similar to the arcade games Blockade and Light Cycles. Each player controls the direction of a trace of light and attempts to force the other player into a trace or a wall.

When the game begins, it prompts the players for a speed setting. The larger this number is, the slower the traces move. A good starting value for new players is 50, and ten to 20 is suitable for those with some experience. Zero gives lightning-fast action and is challenging for even the best players.

Once the game area is drawn, the traces will begin moving when a key is pressed (this delay gives time for hands to be positioned on the keyboard). The direction of the traces is

Address correspondence to Robert Hurt, 6906 Friendly Road, Greensboro, NC 27410.

controlled by four keys arranged in a right, left, up and down pattern. The blue player uses the D, A, W and Z keys; the orange player uses the L, J, I and M keys. The action continues until one or both players collide with something. After the option to quit playing is selected, the computer reports the number of victories for each side.

Program Notes

This program makes use of several interesting techniques and procedures. Although this sort of action is best controlled by joysticks rather than the keyboard, few people own two of them. Also, the function to read a value from the paddle is quite slow to execute. So I decided to go along with an idea similar to the cursor movement schemes of the autostart ROM and several word processors. These use four keys—one on the top row, two on the middle row and one on the bottom row—to represent the four directions (e.g., I, J, K and M). I found it was awkward to use two adjacent keys, so I moved the right key over by one. This comfortably suits a right-handed person with his thumb on the down key. Left-handed people will find it more convenient to move the left key over instead.

I also included a crash-proof integer input routine, READI, for entering the speed setting. The Pascal system has a less-than-graceful way of handling input errors—they crash the program. But there is a way around it by using the (*$I-*) compiler option. While this is engaged, the program doesn't use input/output error checking. The IOResult function returns a nonzero value if there was an error in the last operation. This way, the program is able to give an error message similar to Basic if a bad input format is used.

The traces are drawn as short segments that are four pixels, or graphics points, long. Only two sets of data are maintained for each trace: its current x,y position and its heading. Due to the nature of the graphics hardware, the color orange can only be drawn in odd columns and blue only in even columns. Thus the x coordinate also tells what color the trace is. This feature is used by several of the routines (see listing).

After giving instructions and reading the game speed, the program initializes the starting positions of the light traces, pausing until a key is pressed before continuing. The main execution loop begins now. First there

Listing continued.

```
FUNCTION CLRCRS(X,Y,ANG: INTEGER): INTEGER;
(*                                                                    *)
(*   THIS FUNCTION TESTS TO SEE IF THE LIGHTTRACE HAS A CLEAR         *)
(*   PATH OR IF IT IS GOING TO COLLIDE WITH A WALL OR TRACE.          *)
(*   IT RETURNS 0 IF THE COURSE IS CLEAR, 1 IN CASE OF                *)
(*   ANY COLLISION.                                                   *)
(*                                                                    *)
(*   INPUT PARAMETERS:                                                *)
(*     X,Y,ANG - THE LOCATION AND HEADING OF THE TRACE                *)
(*                                                                    *)

VAR D1,D2,XO: INTEGER;

BEGIN
  CLRCRS:= 0;

 (* SET TESTING PARAMETERS BASED ON COLOR OF TRACE *)
  IF ODD(X) THEN BEGIN
    D1:= 3;
    D2:= 5;
    XO:= -1
    END
  ELSE BEGIN
    D1:= 5;
    D2:= 3;
    XO:= 1
    END;

  CASE ANG OF
    0:   IF (SCREENBIT(X+4,Y)) OR (SCREENBIT(X+D1,Y)) THEN CLRCRS:=1;
    90:  IF (SCREENBIT(X,Y+4)) OR (SCREENBIT(X+XO,Y+4)) THEN CLRCRS:=1;
    180: IF (SCREENBIT(X-4,Y)) OR (SCREENBIT(X-D2,Y)) THEN CLRCRS:=1;
    270: IF (SCREENBIT(X,Y-4)) OR (SCREENBIT(X+XO,Y-4)) THEN CLRCRS:=1
         END
  END;


PROCEDURE MOVETRACE(VAR X,Y:INTEGER;ANG: INTEGER);
(*                                                                    *)
(*   MOVES LIGHTTRACE ACROSS GRID ONE UNIT.                           *)
(*                                                                    *)
(*   INPUT PARAMETER:                                                 *)
(*     ANG - CURRENT HEADING                                          *)
(*                                                                    *)
(*   INPUT/OUTPUT PARAMETERS:                                         *)
(*     X,Y - COORDINATES OF LIGHTTRACE, ARE UPDATED AFTER MOVE        *)
(*                                                                    *)

BEGIN
  PENCOLOR(NONE);
  MOVETO(X,Y);
  TURNTO(ANG);

 (* BLUE TRACE IN EVEN ROWS, ORANGE IN ODD ROWS *)
  IF ODD(X) THEN PENCOLOR(ORANGE)
  ELSE PENCOLOR(BLUE);

  MOVE(4);
  X:= TURTLEX;
  Y:= TURTLEY
  END;


PROCEDURE TURNTRACE(VAR ANG1,ANG2:INTEGER);
(*                                                                    *)
(*   SCANS KEYBOARD TO SEE IF A MOVEMENT COMMAND HAS BEEN             *)
(*   ENTERED BY EITHER PLAYER.                                        *)
(*                                                                    *)
(*   OUTPUT PARAMETERS:                                               *)
(*     ANG1,ANG2 - HEADINGS FOR LIGHTTRACES; ARE UPDATED IF           *)
(*       COURSE CHANGE HAS BEEN ENTERED                               *)

VAR KEY: CHAR;   (* KEYBOARD CHARACTER *)

BEGIN
  IF KEYPRESS THEN BEGIN
    READ(KEYBOARD,KEY);
    IF KEY IN ['I','J','L','M'] THEN
      CASE KEY OF
(* MAIN PROGRAM *)
BEGIN

 (* INITIALIZE SCORES AND GIVE INSTRUCTIONS *)
  BSCORE:= 0;
  OSCORE:= 0;
  INSTRUCT;

 (* BEGIN GAME LOOP *)

  REPEAT
    WRITELN;
    WRITELN('LIGHTTRACE CONTROL CODES:');
    WRITELN;
    WRITELN('           BLUE    ORANGE');
    WRITELN;
    WRITELN('     UP      I         W');
    WRITELN('   DOWN      M         Z');
    WRITELN('  RIGHT      L         D');
    WRITELN('   LEFT      J         A');
    WRITELN;
```

More

Listing continued.

```
    WRITELN;
    WRITE('PLEASE ENTER SPEED (HIGHER #S SLOWER)');
    READI(SPD);
    INITTURTLE;
    MOVETO(0,0);
    PENCOLOR(WHITE);
    MOVETO(277,0); MOVETO(277,189);
    MOVETO(0,189); MOVETO(0,1);
    MOVETO(276,1); MOVETO(276,188);
    MOVETO(1,188); MOVETO(1,1);

  (* INITIALIZE LIGHTTRACE POSITION *)
    PENCOLOR(NONE);
  (* EVEN X COORD FOR BLUE TRACE, ODD FOR ORANGE *)
    ANG1:= 90; X1:= 140; Y1:= 12;
    ANG2:= 270; X2:= 141; Y2:= 176;
    COLL:= 0;

  (* WAIT FOR KEYPRESS TO SIGNAL START *)
    READ(DUMMY);
    REZZ;

  (* MAIN LOOP *)
    WHILE COLL=0 DO BEGIN

      (* TIME DELAY FOR SPEED FACTOR *)
       FOR I:= 1 TO SPD DO TURNTRACE(ANG1,ANG2);

      (* CHECK FOR NEW DIRECTION, COLLISION, MOVE TRACE *)
       TURNTRACE(ANG1,ANG2);
       COLL:= CLRCRS(X1,Y1,ANG1);
       MOVETRACE(X1,Y1,ANG1);
       TURNTRACE(ANG1,ANG2);
       COLL:= COLL + 2*CLRCRS(X2,Y2,ANG2);
       MOVETRACE(X2,Y2,ANG2);
       END;

  (* END OF MAIN LOOP *)
    DEREZZ;
    PAGE(OUTPUT);
    TEXTMODE;

  (* GIVE RESULTS, UPDATE SCORES *)
    CASE COLL OF
         'I':  ANG1:=90;
         'J':  ANG1:=180;
         'L':  ANG1:=0;
         'M':  ANG1:=270
         END
    ELSE IF KEY IN ['W','A','D','Z'] THEN
      CASE KEY OF
         'W':  ANG2:=90;
         'A':  ANG2:=180;
         'D':  ANG2:=0;
         'Z':  ANG2:=270
         END
    END
END;
PROCEDURE INSTRUCT;
(*
(*   PRINTS OUT GAME INTRODUCTION AND INSTRUCTIONS.          *)
(*                                                           *)

BEGIN
  PAGE(OUTPUT);
  WRITELN('LIGHTTRACE');
  WRITELN;
  WRITELN;
  WRITELN('WELCOME USERS.');
  WRITELN;
  WRITELN('  YOUR OBJECT IS TO MANEUVER YOUR LIGHT-');
  WRITELN('TRACE USING THE KEYS SHOWN, FORCING THE');
  WRITELN('OTHER PLAYER TO RUN INTO A WALL OR');
  WRITELN('ANOTHER LIGHTTRACE.');
  WRITELN;
  WRITELN('  GOOD LUCK.');
  WRITELN;
  WRITELN
  END;


PROCEDURE REZZ;
(*
(*   PRODUCES SOUND EFFECTS AT START.                        *)
(*                                                           *)

VAR I,J: INTEGER;

BEGIN
  FOR I:= 1 TO 3 DO
    FOR J:= 10 TO 25 DO NOTE(J,3)
END;


PROCEDURE DEREZZ;
(*
(*   PRODUCES CRASH SOUND AT END.                            *)
(*                                                           *)

VAR I:INTEGER;

BEGIN
  FOR I:= 30 DOWNTO 5 DO NOTE(I,3);
  NOTE(4,75);
 (* PAUSE *)
  NOTE(0,200)
END;
      1: BEGIN
           WRITELN('BLUE TRACE WAS DE-REZZED');
           OSCORE:= OSCORE + 1;
         END;

      2: BEGIN
           WRITELN('ORANGE TRACE WAS DE-REZZED');
           BSCORE:= BSCORE + 1;
         END;

      3: WRITELN('BOTH TRACES WERE DE-REZZED');

    END;

    WRITELN;
    WRITELN('DO YOU WISH TO PLAY AGAIN?');
    NOTE(20,100);
   (* READ LEFTOVER CHARACTERS FROM BUFFER *)
    WHILE KEYPRESS DO READ(KEYBOARD,DUMMY);
   (* NOW READ RESPONSE *)
    READ(DUMMY);
    PAGE(OUTPUT);
    UNTIL DUMMY='N';

 (* END GAME LOOP *)

 (* REPORT RESULTS *)
  GOTOXY(5,5);
  WRITELN('RESULTS OF GAME:');
  WRITELN;
  WRITELN;
  WRITELN('BLUE TRACE: ',BSCORE,' VICTORIES.');
  WRITELN;
  WRITELN('ORANGE TRACE: ',OSCORE,' VICTORIES.');
  WRITELN;
  WRITELN
END.
```

is a delay loop (the number of iterations is equal to the game speed) that repeatedly checks to see if either player has changed direction. The orange trace is moved and a flag is set if it has collided with anything, then the blue trace is moved and checked. If there is no collision, the main loop is repeated.

The test for a clear course ahead of the trace, CLRCRS, is in the form of a function returning a 1 if there is a collision. It tests whether there is something plotted in the next position the trace will move to. Several parameters, D1, D2, and X0 are set, depending on the color of the trace. These take into account the fact that traces are drawn in alternate columns and checks the two points where an orange or blue line would exist.

Short and Straightforward

Although this program is rather short and straightforward, it can be quite exciting. It can easily be made more sophisticated with a little effort. For example, the sound effects can be vamped up a bit. Other possibilities include alternate starting positions and obstacles. An effective one-player game can be made by trying to steer through a simple maze. Have fun experimenting with it and happy tracing!■

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The Bottom Line On Top-of-the-Line Accounting

Purchasing an accounting system is an expensive investment. But with the help of author James McCoy, you can get the system best suited for your records.

James A. McCoy

How would you like to spend $30,000 on an accounting system, only to find it does not work? This is, unfortunately, all too common.

The number of horror stories about purchasing and installing inadequate software continues to increase. Fueled by eager sales representatives, deceptive product advertising and buyer ignorance, it's easy to understand how a user could select an inappropriate accounting package.

Each day, more and more people are being confronted with the task of selecting computer programs and hardware. The performance/cost ratio of computing power continues to rise. Today, computer accounting systems range in cost from $6000 to $12,000 for single-user installations. In addition, the indirect costs of selection and implementation may easily double the figure.

Someday you may have to participate in choosing a computerized accounting system; to give direction to your task, a structured, disciplined approach is required.

Computerized accounting can bring substantial benefits. Inventory levels can often be reduced, cash flow monitored, accounts receivable tracked and profit margins and expenses summarized.

The accounting process provides information on financial performance, investment of funds and levels of profitability. Timely, accurate data summarizes business activity, measures performance and forms the basis for decision making. The standardization of internal operations also forces organizational discipline.

Routine functions common to accounting departments are well-suited for computerization, yet the uniqueness of the accounting process within each firm demands caution in selecting an automated system.

Finding an accounting system is not easy—with the myriad of programs and machines available, it is more confusing than ever. Many first-time purchasers of accounting systems unfortunately fail to adequately define the needs of their businesses, evaluate available options and ultimately make judicious decisions.

This article attempts to give structure to the process of evaluating, purchasing and implementing a computer-based accounting system. Key considerations and reviews of respected programs familiar to the author are also presented.

Major Considerations

Several considerations are involved in evaluating, selecting and integrating an accounting system.

First, closely examine your business to identify potential constraints. You must examine budgetary factors, personnel and any other germane environmental considerations.

The system selected should be capable of satisfying current requirements and paralleling organizational growth. Current and future organizational direction must be factored into this analysis.

Personnel who will be affected by the changes should have a voice in listing the capabilities desired in the new system. Active participation by employees in system selection is a positive step. An accounting system is meant to serve the organization, not just the controller or the accounting department.

Never underestimate, or make assumptions about, the human reaction to computers. Lack of support will jeopardize their use.

The human implications of automation are critical. Are personnel receptive to a new or replacement system? Simply purchasing equipment and expecting employees to eagerly embrace new ways of accomplishing tasks has proven to be a perilous approach. Instead, set the stage and then slowly introduce new techniques. Active use of role models may be helpful. Careful attention to the human factors will yield benefits.

Before you begin to consider specific choices for implementing a computerized accounting system, you should be aware of the significant differences among the many accounting programs available on today's market. They cover a broad spectrum of functional features: storage capacities, numbering schemes for accounts and other information, specific fields and their sizes and relative ease of installation and subsequent operation all vary.

Furthermore, control of error-trapping and detection is handled differently from program to program. The time-period for transaction retention ranges from a limited one month to several years. Integration between modules and audit trails produced are not standardized. Available reports and the presentation of information can assume unlimited forms. Indeed, the list is almost endless.

Some differences may be apparent even to the layperson, but the subtleties of operation are discernable only by trained professionals. Yet managers and employees must live with

The author is a certified public accountant and independent consultant specializing in microcomputer accounting systems. He can be contacted c/o Microcomputing, *80 Pine Street, Peterborough, NH 03458.*

these differences in capabilities and operation once a particular program has been chosen.

Finally, before moving on to more specific considerations in choosing an accounting program, let us first analyze briefly why computerized systems often fail. Identifying mistakes others have made in similar situations is fruitful:

- Failure to formally define systems requirements;
- Reluctance to seek expert advice;
- Lack of input and internal communication by employees;
- Failure to adequately define and evaluate appropriate options;
- Absence of an implementation strategy;
- Failure to provide adequate training;

> Recognizing potential pitfalls is the fist step in avoiding catastrophe.

- Lack of appropriate controls over ongoing systems use.

Recognizing potential pitfalls is the first step in avoiding catastrophe. The old adage, "An ounce of prevention is worth a pound of cure," has merit when choosing an accounting system.

Define Your Requirements

The first step in defining the requirements of your accounting system is to identify the functional accounting areas where computerization will be beneficial: general ledger leading to financial statement preparation, accounts receivable and payable, job-costing, inventory control, invoicing, order entry and payroll.

Many firms may not need to computerize all of these functions. For instance, service organizations have no inventory and are concerned primarily with general ledger, invoicing and accounts receivable maintenance. However, a manufacturer may need a full range of facilities.

Additional tasks are inherent in accounting departments; forecasting, budgeting and tracking are automated easily via spreadsheet or filing programs. Functional areas and tasks must be prioritized and further scrutinized to assess automation feasibility.

Many decision makers fail to formally define the requirements that an automated accounting system should possess. Including a description of functional accounting areas, key information files (inventory, order entry), relevant fields of information within files (reorder point, inventory part number, vendor, on-hand, on-order, cost, retail price) and specific information and frequency of formal reports helps clarify the capabilities desired in the proposed system and provides a basis for evaluating potential solutions. Savvy practitioners know what they are seeking—and its value—before they go shopping.

In terms of storage requirements, the accounting modules selected and level of activity determine the appropriate storage medium. Most accounting programs have a sizing chart to estimate storage requirements using accounting activity parameters.

If you have never selected or implemented an accounting system, consider contacting a consultant for assistance.

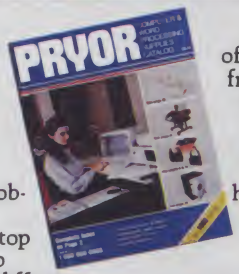
Look for someone with an established track record, familiarity with similar situations and a background suitable for the assignment. Check references, define responsibilities, manage and direct the consultant. He or she should assist in identifying the requirements for your system, recommend possible solutions, analyze their

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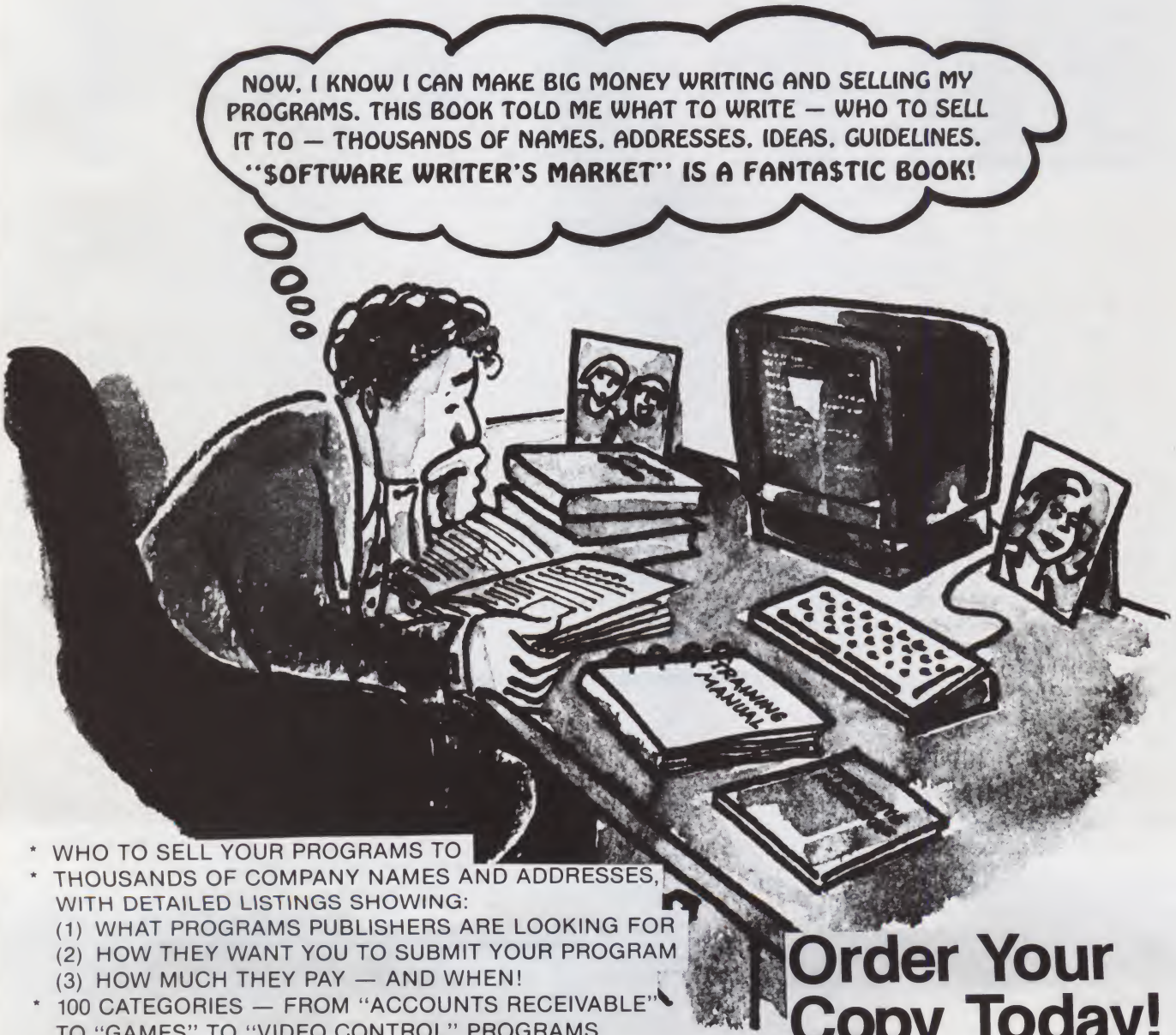


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strengths and weaknesses, and possibly assist in system implementation. A consultant can save time and dollars and bring professional guidance to a complex matter.

Arriving at the Solution

After carefully determining specific requirements, vendors can be contacted for recommendations of potential solutions. Here, communication is important. The background of your business, key areas for computerization and other pertinent facts must be spelled out carefully to a sales representative or consultant before solutions can be proffered.

Proposals not meeting your requirements can be eliminated, leaving two or three candidates for further analysis. Arrange a demonstration of the systems and obtain user references at this point.

Also, finding a canned, mass-marketed software program rarely meets 100 percent—or even 80 percent—of your needs. Review potential programs according to priority of the key accounting functions previously established. Before selecting a system, potential solutions should be examined thoroughly to assess their capabilities and limitations. As always, program selection precedes hardware selection.

If an acceptable accounting system is found, implementing and integrating the system into the work environment follows. A well-designed implementation strategy cushions the inevitable shock and chaos engendered by any new system.

Functions to be automated should follow the established priorities. Place computers and terminals in strategic locations accessible to operators. Ensure that proper workstations appropriate to computer usage are installed simultaneously.

Operator training needs should be assessed and satisfied. You may need to design forms to facilitate data input. Data must be channeled to operators, and users of the system must be informed of responsibilities and procedures. New forms for invoices, checks or other accounting documents should be ordered. A servicing arrangement should be established.

Modification of paper and information flow is required. Numbering schemes may have to be changed—a difficult job, as established norms and practices are not readily altered. Especially in larger organizations, inertia often rules.

Ten of the Best in Brief

Fitting rigid accounting programs into flexible, varied business environments is not easy. The intricacies of the accounting structure cause most firms to have specific needs, and canned software must be closely scrutinized for consistency with existing accounting practices.

Many accounting programs are versions of successful programs previously used with minicomputers. Their migration and adaptation to the micro environment encompasses the best of both worlds: outstanding, proven products and low cost.

The following reviews contain highlights of some unique—and critical—differences in requirements often encountered when evaluating programs. It is not meant to be an exclusive or comprehensive list of accounting packages; it is a reflection of the experiences and biases of the author. Program selection criteria include comprehensiveness, accounting soundness, flexibility, support, controls and personal experiences. Key features are noted, although many are similar, in order to highlight considerations with which readers should be concerned. As in all software selection, the objective is to find a program that fits your needs.

CYMA
CYMA Corp.
2160 East Brown Road
Mesa, AZ 85203
602-835-8880

Powerful and versatile, the CYMA set of accounting modules belongs to the future. It is supported by a variety of operating systems and is compatible with many micros. With file and record lock-out, multi-user function is possible.

Among the attractive features of the inventory package are multiple pricing levels and locations, plus generation of purchase orders. The accounts receivable program calculates finance charges and discounts based on terms and has strong reporting capabilities. The payroll package handles multi state payrolls, has user-definable tax tables and prints standard reports. CYMA is ideal for a sophisticated business environment.

Relevant controls must be utilized. Back-up of key data files and programs, security measures, training of alternate personnel and protection against power problems and downtime are vital.

Employees who have been freed from routine, mundane tasks will have time for more productive, creative activities.

Establish internal procedures to verify data input and ensure its proper recording. Most of the accounting systems featured later in this article have an audit trail for reconstructing transactions—a key control. In addition, a batch orientation usually allows editing and verification of entries prior to posting. Controls are important, and they should not be ignored.

A Summing Up

Several outstanding accounting systems are available. Some of the more capable programs, in the author's opinion, have been summarized here.

Potential purchasers, however, should approach with caution. Formal definition of requirements, consulting experts, careful consideration of alternatives and implementation strategy and appropriate internal procedures and controls are advised.

The benefits that can be realized from an *effective* accounting system are substantial. Such a system enhances the control and monitoring of business activity and provides the kind of timely financial information that promotes competent decision making.

Employees who have been freed from routine, mundane tasks will have time for more productive, creative activities. A carefully selected and implemented accounting system is the nucleus of effective business management.■

Great Plains
Great Plains Software
123 North 15th St.
Fargo, ND 58102
701-293-8483

With version 2.0, Great Plains has become a marketable accounting system. Designed for hard-disk storage, the program features multiple levels of password security, mailing labels and a thorough inventory system. The reporting capabilities of the inventory system are noteworthy. It provides profit margin and sales commission information in a variety of formats. Commissions are transferable to payroll and calculable based on several methods. Inventory items can be monitored by serial number. Profit margin and activity reporting features yield useful information for management analysis and decision making.

Although lacking full internal or external order-entry tracking, Great Plains is still an excellent package. The accounts receivable module allows the addition of finance charges and gives an analysis of activity by customer. This program handles up to $1 billion in account balances. Any retailer or wholesaler should seriously consider this package.

EasyBusiness System
Information Unlimited Software
2401 Marinship Way
Sausalito, CA 94965
415-331-6700

In addition to its popular EasyWriter, EasyFiler, EasyPlanner and other programs, the IUS accounting system is also a winner. The program executes quickly, handles multiple companies and runs well in a floppy-disk environment. Files are updated and transactions purged when the disk is filled.

Special praise goes to its flexibility and management reporting capability. Reports can be defined, retained and recalled later with up to nine optional categories comparing current monthly or year-to-date figures, last year's comparable period and budget with meaningful, user-definable formats. A sophisticated system, it will make serious accounting and computer enthusiasts hunger for more.

The accounts receivable module allows the addition of finance charges to overdue balances, prints dunning notices, prints an aged trial balance of outstanding receivables by user-defined time periods and generates mailing labels.

Meanwhile, the accounts payable module provides summaries of discounts not taken and upcoming cash requirements for payables satisfaction. Order entry generates invoices and tracks sales orders. The inventory allows valuation by LIFO, FIFO or weighted average costing methods. Overall, the reporting and flexibility are outstanding.

Real World
Real World Software
(formerly MBSI)
Dover Road
Willow Hill Building
Chichester, NH 03263
603-798-5700

The former MBSI system is a proven one adapted from the minicomputer environment. Accounts receivable contains a number of useful features: finance charge add-ons, aging reports of outstanding items, cash receipts and commission calculations. The order-entry billing function is designed for distributors. Order processing automatically prints invoices and posts billing information to accounts receivable. Limited inventory control is available as an option.

Sales analysis provides information by customer, sales representative, state, item and other categories. Accounts payable, among other functions, pays bills and prints a status report of outstanding items. Payroll is an extensive system and even prints

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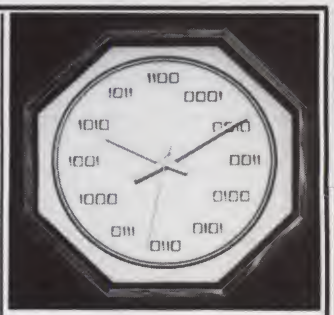
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Micro Business Applications, Inc.
12281 Nicollet Ave. South
Burnsville, MN 55337
612-894-3470

Formerly released under the Palantir label, MBA is an established program with fast execution. The accounting modules are integratable or stand-alone. The chart of accounts is user-definable. Invoicing occurs out of either the accounts receivable or inventory module. In addition, depreciation schedules and fixed asset tracking are available.

For forecasting and budgeting, a link to the popular SuperCalc spreadsheet is available. As with all the packages reviewed here, the MBA accounting software contains an excellent audit trail and extensive editing capabilities.

For a manufacturing environment, the inventory control module is especially relevant, featuring order entry and extensive management reporting capabilities, and providing costing by standard, average or actual costs. Up to 12 months of transactions are retained and adjustments can be made to prior periods. The package handles multiple companies and profit centers, and can even be considered by accountants as a write-up package.

Open Systems
Open Systems, Inc.
430 Oak Grove
Suite 409
Minneapolis, MN 55403
612-870-3515

Open Systems is a complete program available for a number of operating systems. Its order processing is noteworthy and can be integrated with the accounts receivable, general ledger, job-costing and inventory modules.

Accounts receivable is flexible with extensive editing capabilities. User-defined finance charges can be added to outstanding balances. The management reporting facilities are excellent throughout the package.

The accounts payable function permits status definition of hold, prepaid, installment payments or full payment. The inventory module allows costing by standard or average costs, FIFO or LIFO. Reorder points and overstock conditions are definable. Payroll allows multiple pay rates, piece rate and allocation to jobs, and has a payroll edit function for proofreading prior to check cutting.

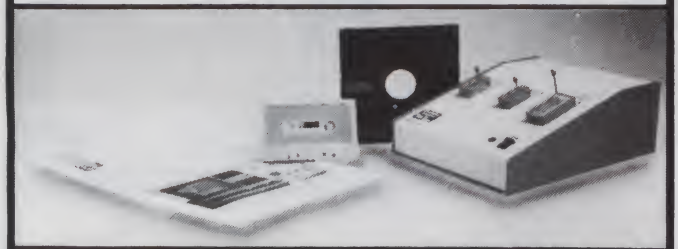
The job cost capabilities are relevant in an environment other than process costing. Jobs and phases are identifiable with reasonable reporting capabilities and good editing features.

Solomon Series
Computech Group, Inc.
Main Line Industrial Park
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Frazer, PA 19355
215-644-3344

A fully integratable, comprehensive system, the Solomon Series is available in three versions, levels I, II and III. In addition to a report generator for free financial statement formatting, it has extensive reporting capabilities in other areas. Specifically, job costing, productivity management, manpower planning and other features available in the level II version are useful in a service organization. Level III also contains inventory control. The level I version is less comprehensive, containing most standard account-

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ing functions (but not inventory).

Menus guide you through program operation. The package allows multiple company reporting with a hard disk and has password security control. As a proven accounting program, it comes highly recommended.

State of the Art
State of the Art, Inc.
3183-A Airway Ave.
Costa Mesa, CA 92626
714-850-0111

State of the Art modules are menu-driven and operate either on floppies or, for greater efficiency, with a hard disk. The programs are relatively easy to install and use. Complete audit trails are generated, and unbalanced transactions are not permitted.

With the budgeting and financial reporting module, extensive management reporting becomes possible. In addition, comparisons of budget, actual and prior-year figures and user-definable financial statements and reports can be designed with the report generator. Multiple companies can be maintained with the general ledger.

The documentation is comprehensive and oriented toward computerists with minimal accounting knowledge. Inventory can be segregated by product line and yields variances from budget. The sales invoicing module provides information on back orders, commissions and other valuable management summaries.

Structured Systems
Structured Systems Group, Inc.
5204 Claremont
Oakland, CA 94618
415-547-1567

Tested and proven, Structured Systems accounting modules are flexible with good controls. As with many of these programs, branch or profit center reporting is possible. Batch processing allows editing and correction of errors prior to final posting. General ledger features a separate category of accounts for tax purposes that assists you in keeping two sets of books, one for tax purposes and one for general financial reporting. Transaction retention is limited only by disk space—an unusual feature for this class of programs.

The inventory system flags user-defined reorder items and quantities. Up to 99 revenue accounts can be defined, and invoicing is located in the accounts receivable module. Data transfer to Structured Systems' word processing, database analyst and spreadsheet programs can be effected. Firms with standard needs will find this package quite useful.

TCS
TCS Software, Inc.
3209 Fondren Road
Houston, TX 77063
713-977-7804

An investment in this well-planned set of programs is worthwhile. The TCS package is an integrated system with a built-in database. It comes complete with a report generator and utilities for database access and creation of desired reports. It also reads and writes files to a standard ASCII format for compatibility with a number of other popular programs.

Payroll maintains separate files for as many states as desired. Prior period adjustments are permitted—a feature not common to accounting packages. On-line, instantaneous updating of information can be a problem, as errors in data input inevitably occur; the availability of a hard-copy audit trail helps minimize such risks.

In addition to its accounting series, TCS also markets a powerful client write-up package for public accountants. As a menu-driven, well-rounded system, it comes highly recommended.

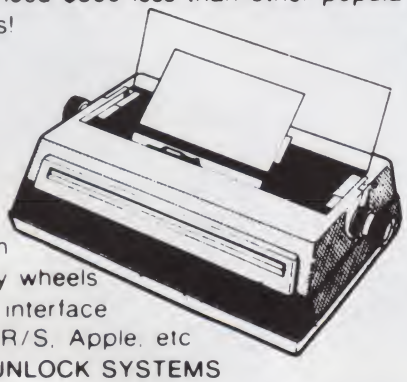
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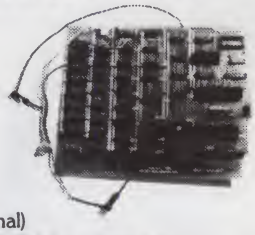
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The IBM Personal Computer XT

The Good, the CAD And the Apple

This first of a two-part article describes a Computer-Aided Design (CAD) program that lets you draw and maintain a library of shapes. This Apple II program is written in Logo and illustrates some of that language's features.

By Richard Fritzson



The system used with the author's computer-aided design package: an Apple, digitizer and plotter.



Graphics example.

You may have at your fingertips a drawing or drafting tool that surpasses all others: your computer. Though it may have a resolution lower than what you can achieve with a sharp pencil, it has one advantage over noncomputer tools: it can be programmed.

Your pencil can't remember how to draw a PNP-type transistor; your computer can. Your pen can't remember how to draw that standard address-decoder circuit you always use on your projects; your computer can. Your paintbrush can't be programmed to put five of what you just painted in five different places on the page; your computer can.

What Is Computer-Aided Design?

Commercial computer-aided design (CAD) systems have large, high-resolution screens, often equipped for color, to display complex drawings. They usually contain libraries of specialized symbols appropriate for the application.

For example, electronic CAD systems might have a library of standard electronics symbols, VLSI drafting systems might maintain a set of part-geometry drawings, and mechanical drafting systems might have extensive libraries of shapes, connectors, welding symbols, and so on. A user of any of these systems just points to a symbol in a symbol menu and then

Address correspondence to Richard Fritzson, 5814 Russett Road #4, Madison, WI 53711.

points to where he wants it to appear—presto, there it is.

This article describes an Apple II program that 1) allows you to draw pictures on the Apple screen using a pointing device; 2) can maintain a library of standard shapes that you can select from a menu and have drawn automatically; 3) draws any picture you create on a digital plotter or a graphics printer; and, perhaps most interesting of all, 4) automatically writes a program that, when executed, redraws your picture.

Because of the limitations of the standard Apple II graphics screen, I don't really believe that this program has many practical CAD applications. However, it's fun to use just for drawing on the screen, and it can be used to automatically write programs that draw pictures—especially complex scenes with different shapes (such as those used in game programs) that generally make for tedious programming.

The program can also be used in school classes that teach computer-aided design. While it may not have the capabilities of expensive commercial systems, this system allows access to the full source code (written in Logo, one of the simplest programming languages around), which means that the hows and whys of a CAD system can be investigated.

Furthermore, the program was written so that it can be easily extended, even by people who don't know all of the details of how it works and who know only the turtle graphics side of Logo. This makes it a reasonable tool even in classes that aren't computer-oriented, such as vocational educational design classes.

Finally, for people interested in Logo, this program illustrates some features and uses of Logo, such as interfacing to nonstandard peripherals and writing Logo programs that write Logo programs.

Why Logo?

From the variety of programming languages available for the Apple, I chose Logo for this project because it is highly interactive, modular and extensible. It also includes an easy-to-use, high-resolution graphics package and primitives for writing programs that can write programs themselves. These attributes made it preferable to both Basic and Pascal.

Logo is readable and is easily understood by nonprogrammers. This, for my purposes, made it preferable to both Forth and Lisp. However, both of those languages have advantages that make them excellent choices for anyone who wants to rewrite this package.

Forth has lower memory requirements than Logo (and this is a memory-intensive system), while a good implementation of Lisp would have made some of the programming easier. (In fact, the program is being rewritten in Lisp for a nonApple system.)

I chose Terrapin Logo because of the need to write assembly language interfaces to some peripherals. Unlike Apple Logo, Terrapin includes a 6502 assembler and procedures for calling machine language subroutines from Logo. If you don't need these features, you can use any of the available Logos, although you'll have to do some rewriting.

Lots and Lots Of Logo Listings

The text of this article contains numerous descriptions of Logo procedures. These appear as short listings, with only a few procedures each, instead of as one continuous listing at the end. To facilitate reconstruction of the whole program, each listing contains a comment that identifies which of the several Logo files it is part of.

Procedures that aren't part of the final package but are presented simply to illustrate points appear as examples instead of as listings. They have no file identifications.

Furthermore, the comments that appear in the listings are not actually included in the copies of the procedures that are loaded into the Apple's memory. This, of course, is to reduce memory requirements.

For readers who don't wish to type the code from the article, I'll copy it onto a reader-supplied disk that is accompanied by a stamped, self-addressed envelope, for $5.

R.F.

Equipment

To implement this package, you need an Apple II Plus with 48K, a 16K memory card and a single disk drive (all required for Logo operation) and, of course, a version of Logo.

You also need some type of pointing device—something that can be used to move a cursor around on the screen. While you could use keyboard keys for this purpose the way many word processors do, this is inconvenient and slow for most graphics applications. The standard Apple game paddles work, but you need two of them—one for vertical movement and one for horizontal movement.

An economical choice is a joystick, which provides the necessary two-dimensional pointing capability. Joysticks often can be connected to the Apple through the game paddle ports and accessed from Logo without any special effort. Other possibilities are a light pen, a trackball or a mouse.

I used a digitizer pad, a Houston Instruments HiPad, instead of a joystick because it was available. You don't need this relatively expensive device, however; a joystick or any other low-cost pointer will do.

Whatever kind you choose, it should have at least one button associated with it (as most paddles and joysticks have and as the digitizer's cursor has) and have a resolution at least as good as the screen's (approximately 240 points vertically and 280 points horizontally).

Lastly, and completely optionally, if you want to produce hard copy of whatever you draw, you will need either a plotter (I used a Houston Instruments HiPlot with six colored pens) or a printer with screen dump software.

Pointing with the Turtle

The purpose of a pointing device is to allow you to physically manipulate some analog device and thereby cause a mark on the screen, called a cursor, to move about, which allows you to point to pictures and places on the screen. The device should have two dimensions of movement, allowing you to move the cursor both left and right and up and down.

In describing this part of the program, I assume that you're using either two game paddles, one joystick interfaced through the game paddle ports or a HiPad digitizer. If you're using some other peripheral, you'll need to duplicate the procedures in Listings 1 or 3 (described below) for your pointing device. Then the rest of the program should run without much trouble.

Coordinate Scales

The Logo graphics screen is a Cartesian plane with the origin, point (0,0), in the center (Fig. 1). y axis boundaries extend from $(0, -120)$ to $(0, +120)$; x axis boundaries extend

from (−140,0) to (+140,0). A standard joystick delivers coordinates within the 0–256 range in both the x and y axes.

To match the two different coordinate systems, the zero point of the joystick must be moved to the middle of its range, not to one end of it. This is done by subtracting 128 from each value. The new ranges are from −128 to +127. These do not match the Logo coordinate system exactly, but they are close enough to be useable.

The effects of not matching exactly are that, in the x direction, locations within 12 dots of either the left or right edge of the screen cannot be specified, nor can points that are eight points higher or lower than the top and bottom edges. The latter effect can be blocked by using MAX and MIN procedures, but it's hardly worth the effort.

Listing 1 shows the definition of two Logo procedures, P.XS and P.YS, which allow you to access the current position of the joystick scaled to the Logo graphics screen. (It also contains the procedure P.BUTTON, which returns true if you're pressing the button on the joystick.) These procedures assume you have the joystick attached to game paddle ports 0 and 1.

If you aren't using a joystick or game paddle but instead have a digitizer pad or something like it, the problem is a little more complex.

There are two parts to the task: accessing the pad from Logo and then scaling the coordinate systems down to Logo's graphics screen size. Accessing the Houston Instruments HiPad from Logo requires assembly language. The complete assembly-language program, written in Terrapin Logo assembly language, is in Listing 2. The comments describe how it works.

The main differences between using a pad and a joystick are that the pad has a different scale than the joystick (approximately 0–2600) and that it has to be explicitly polled, or read, before you can access its current position. The only consequence of the latter is that you have to execute a Logo word that reads the pad's position before you can use the procedures that output its x and y coordinates. Listing 3 contains a procedure called Digitize, which does this, and the procedures P.X and P.Y, which return the x and y values.

```
; Extract and Scale X Coordinate

TO P.XS
    OUTPUT (PADDLE 0)-127
END

; Extract and Scale Y Coordinate

TO P.YS
    OUTPUT (PADDLE 1)-127
END

; Test For Pointer Button

TO P.BUTTON
    OUTPUT PADDLEBUTTON 0
END
```

Listing 1. Joystick 1 game paddle interface procedures (File: Pointer).

```
TO DRAW
        IF P.BUTTON THEN PD ELSE PU      ; set the turtle's pen
        SETXY P.XS P.YS                  ; and move it
        DRAW                             ; repeat
END
```

Example 1. A simple hand-sketching routine.

```
TO DOT
        PU FOLLOW                  ;follow the user to a point
        PD FD 1 PU                 ;and draw a dot there
END
```

Example 2. A procedure for drawing dots.

```
TO LINE
  GETPT1 GETPT2            ;get the two points
                           ;(GETPT2 leaves the turtle at point 1)
  PD SETXY P.XS P.YS       ;and draw a line to point two
  PU
END

TO LINES                   ;to repeatedly draw lines. draw one
  LINE LINES               ;then loop
END

TO RECTANGLES              ;to repeatedly draw rectangles
  GETPT1 GETPT2            ;    get two points
  SETY P.YS                ;    corner one
  SETX P.XS                ;    corner two
  SETY :Y                  ;    corner three
  SETX :X                  ;    back to corner four
  RECTANGLES               ; and loop
END
```

Example 3. Procedures for drawing lines and rectangles.

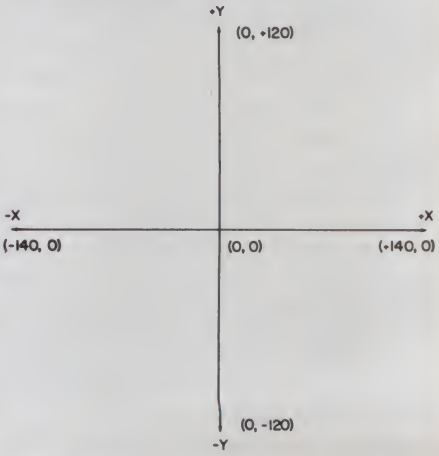


Fig. 1. The Logo graphics coordinate plane.

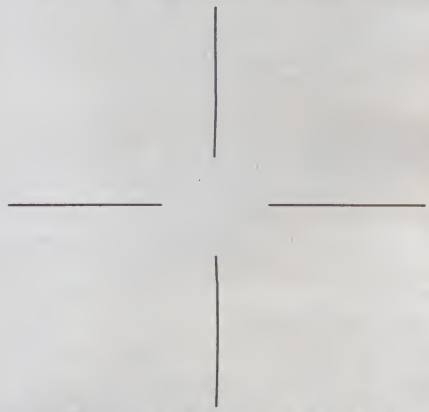


Fig. 2. The cross-hairs turtle. Each of the four lines is two units long. The shape editor commands for drawing this are: D→→u←←; D←←u→→; D!!u!!; and D!!u!!.

The problem of differing coordinate scales is solved by multiplying the pointing device coordinates by a scaling factor then subtracting an offset to put the origin of the scale in the center of the pointing device's range (as it is in the Logo graphics screen).

The scaling factor is derived by dividing the desired number range (either 240 vertically or 280 horizontally) by the range of the pointing device's output (about 2600 for the HiPad). Listing 3 contains the P.XS and P.YS procedures, which scale the HiPad's coordinates down to the Logo turtle's coordinate system, and P.BUTTON, which outputs true if you're pressing the button on the digitizer's cursor.

For anyone using a different pointing device, one of the nice things about Logo is that any pointing device you're using can be mapped into these simple procedures (P.XS, P.XY, P.BUTTON and, possibly, Digitize) and

> The star of Logo's graphics package is the ubiquitous turtle.

then we can all use the same program code from here on. (If you're using the procedures in Listing 1, you can either define a dummy procedure Digitize or simply drop it from any function in which it appears below.)

Grabbing the Turtle

The star of *Logo*'s graphics package is the ubiquitous turtle. It is normally manipulated with commands such as Forward and Back or Left and Right, but we can now move it around directly by using the pointer. Listing 4 contains a procedure, Follow, that links the turtle to the pointing device, causing it to follow you and serve as the on-screen cursor. It quits when you push the pointer's button.

(This procedure, like many others, uses what is called tail-recursion to loop indefinitely; the last line in the procedure conditionally calls the procedure itself, causing it to repeat.)

If the turtle pen is up when this procedure is invoked, then the turtle just moves around on the screen; if the pen is down, it leaves a trail behind it. (It is important to let the program's user know that the pushing of the but-

Listing 2. HiPad digitizer assembly language interface procedures (File: HiPad.ASM).

```
; Procedure for assembling the two parts of
; the assembly language interface

TO ASM.HIPAD
 MAKE "ORG 39336            ; Leave room for the cross hairs
 ASSEMBLE "HIPAD1           ; Assemble Part 1
 ( PRINT "POLL :POLL )      ; Print value of POLL entry point
 ERASE HIPAD1               ; Erase Source code
 PRINT RC                   ; Wait for user to copy down POLL
 ASSEMBLE "HIPAD2           ; Assemble Part 2
 ( PRINT "HPX :HPX )        ; Print other entry points
 ( PRINT "HPY :HPY )
 ( PRINT "HPP :HPP )
 ERASE HIPAD2               ; Erase Source Code
 PRINT RC                   ; Wait for user to copy entry points
                            ; Save object code
 DOS [BSAVE INTERFACE.BIN,A$99A6,L$100]
 ERASE ASM.HIPAD            ; Erase self
END

; HIPAD1 - LOGO/HiPad Interface Part 1
; Description: Contains the poll routine which
; extracts a valid coordinate stream from the HiPad.

TO HIPAD1
 [MAKE "DDRA $ "C0C4]       ; HiPad Data Register
 [MAKE "CTLA $ "C0C5]       ; HiPad Control Register
 HPP1: 0                    ; Holds Button State
 GBYTE: LDA CTLA            ; GBYTE: Extracts a byte from HiPad
        BPL GBYTE
        LDA DDRA
        RTS
 POLL:  LDA # 0             ; POLL: Extract and save a coordinate set
        STA DDRA            ; First initialize the 6820
        LDA # 44
        STA CTLA
 HP1:   JSR GBYTE           ; Wait for a leading byte (Bit 7 = 1, but not FF)
        BPL HP1
        CMP # 255
        BEQ HP1
        AND # 15            ; Extract Cursor Button Status
        STA HPP1            ; and save
        JSR GBYTE           ; Get next byte
        BMI HP1             ; (If not > 0, try again)
        STA ! [:USERPZ+0]   ; else save HIGH X
        JSR GBYTE
        STA ! [:USERPZ+1]   ; and  save LOW  X
        JSR GBYTE
        STA ! [:USERPZ+2]   ; and  save HIGH Y
        JSR GBYTE
        STA ! [:USERPZ+3]   ; and  save LOW  Y
        RTS
END

; HIPAD2 - LOGO/HiPad Interface Part 2
; Description: Has three entry points, one returns
; most recent X coordinate, one the Y coordinate and
; the other the button state.
;       All negative coordinate values are set to zero.
; so HiPad should be reset with cursor in lower left hand corner

TO HIPAD2
 HPX: LDA ! [:USERPZ+1]          ; Extract X Coordinate value
      STA ! NARG1
      LDA ! [:USERPZ  ]
      JMP HPZ
 HPY: LDA ! [:USERPZ+3]          ; Extract Y Coordinate value
      STA ! NARG1
      LDA ! [:USERPZ+2]
 HPZ: PHA
      AND # 64
      BNE HPZ1              ; If Negative, return zero
      PLA
      ROR                   ; Else shift out lower bit of MSB
      PHA
      AND # 31              ; Mask high bits
      STA ! [:NARG2+1]      ; and save MSC
      PLA                   ; shift in high bit of LSB
      ROR
      AND # 128
      ORA ! NARG1
      STA ! [:NARG2+0]      ; and save LSB
      PHA
 HPZ1: PLA
      JMP OTPFX2            ; return integer value

 HPP: LDA HPP1              ; Get Button state
      CMP # 3
      BEQ HPP2              ; If = 3 then return false
      JMP OTPTRU            ; else return true
 HPP2: JMP OTPFLS
 END
```

More

Listing 2 continued.

```
MAKE "USERPZ (252)
MAKE "OTPFLS (7188)
MAKE "OTPTRU (7194)
MAKE "OTPFX2 (7177)
MAKE "ROR [IMP 106]
MAKE "NARG2 (158)
MAKE "NARG1 (162)
```

ton has been detected by the program; ringing the Apple bell is a handy way to do this.)

To conveniently free-hand draw using the turtle, you can use the Draw procedure (Example 1), which lets you move the turtle around with the pointer and put the turtle's pen down when you depress the pointer's button.

```
; Poll the HiPad for a Coordinate

TO DIGITIZE
    .CALL :POLL 0
END

; Extract X coordinate

TO P.X
    OUTPUT .CALL :HPX 0
END

; Extract Y coordinate

TO P.Y
    OUTPUT .CALL :HPY 0
END

; Check HiPad Cursor Button
; OUTPUTs TRUE if Button depressed, FALSE otherwise

TO P.BUTTON
    OUTPUT .CALL :HPP 0
END

; Scale X Coordinate

TO P.XS
 OUTPUT ROUND ( P.X * 9.91194N2 ) - 140
END

; Scale Y Coordinate

TO P.YS
 OUTPUT ROUND ( P.Y * 8.49493N2 ) - 119
END

                          ;These addresses were copied down during
MAKE "POLL 39346          ;the assembly of HIPAD.ASM
MAKE "HPX  39393
MAKE "HPY  39402
MAKE "HPP  39433
```

Listing 3. HiPad digitizer interface procedures (File: Pointer).

```
TO DRAW
  GETPT1 GETPT2              ;get the points
  RUN REQUEST                ;and draw whichever shape the user types
  DRAW                       ;and loop
END

TO LINE
  PD SETXY P.XS P.YS PU
END

TO RECTANGLE
  PD SETY P.YS SETX P.XS
     SETY :Y   SETX :X  PU
END
```

Example 4. Procedure for drawing shapes typed by the user.

Reshaping the Turtle

The turtle is cute, but it's not the best shape I can think of for pointing with, especially since the point at which the turtle is located is not the front tip but a point located inside its body.

Fortunately, Terrapin Logo lets you change the turtle's shape. The system includes a program called Shape.Edit, which facilitates the drawing of new turtle shapes. New shapes can be displayed only as being rotated in 90-degree increments; this is not a limitation, since the CAD package does not support rotation.

I used the Shape.Edit program to create a simple cross-hairs turtle, which is more convenient for pointing at individual points (Fig. 2). This creates a binary file containing the cross-hairs image and a Logo file (Curs.Aux) containing the address of the binary image and some utility functions (for example, Size, for changing the cross-hair's size).

Drawing and Designing

Using the Draw procedure to draw on the screen is fun, but it quickly becomes obvious that you cannot draw anything that requires any degree of precision. The pointing device, whatever it is, is too awkward to manipulate carefully. The way around this problem is to use the pointing device to just point—let a program do the drawing.

For example, to place a single dot on the screen, you could use the Draw procedure (Example 1) to position the turtle (or cross-hairs), depress the button and then try to move the turtle just a bit in order to leave a mark behind. Or, you could write a Logo procedure, Dot, to do it (Example 2).

Executing Dot causes the turtle to follow the pointing device until you press the button. The turtle then draws a line length of one (a dot).

Most useful shapes (lines, squares, circles) require that you identify two points on the screen, not one. Two procedures, GETPT1 and GETPT2 (Listing 5) facilitate this by letting you identify two points on the screen. Move the turtle to one point, push the button; then move to a second point, pushing the button again.

Pushing the button the first time leaves a mark behind to identify where the first point is; pushing it the second time erases that mark so that the screen is clean and whatever figure you want can then be drawn.

The picture-drawing procedure can identify the first point, because the GETPT routines set the global variables X1 and Y1 to the x and y coordinates of the pointer when the button is pressed the first time. It can find the second point because that's where the pointer is still pointing.

If you have a spring-loaded joystick or if you tend to move the pointer a lot, you may want to use a second set of variables, X2 and Y2, to record the location of the second point. Otherwise, you may find that you have moved the cursor between the time you marked the second point and the time the program used its location. Digitizer users don't have to worry about this because the last polled values of P.X and P.Y won't change unless you execute Digitize again.

The WAITB routine ensures that the program doesn't proceed to the GETPT2 routine before you've lifted your finger from the button. This prevents both GETPT1 and GETPT2 from detecting the same button pressing and marking the same point.

One way to leave a mark behind is to have the turtle draw a simple shape and then later erase it by redrawing it in the background color. A neater way is illustrated by the Mark procedure in Listing 5; it uses the Terrapin Logo Size procedure (created by the cursor shape-editing program). This procedure leaves a small cross-hair marker behind (assuming that you've used the Shape.Edit program to change to the cross-hair turtle shape) the first time it is called, and erases it the second time.

Now, to draw a straight line, you can use procedures like Line or Lines; other shapes can be written using these as models (for instance, Rectangles in Example 3).

Admittedly, using SETXY extensively results in a very unturtle-like programming style. There is no need, however, to write these procedures in any particular style. Use whichever is easier for a particular picture—Cartesian coordinates and SETXY, or Turtle graphics and Forward, Back, Left and Right.

This is more fun than free-hand drawing; the pictures are neater and you can always add new shape procedures. What you need, though, is a

```
; Make the Turtle follow the user's pointer

TO FOLLOW
 DIGITIZE          ; poll the pointer
 SETXY P.XS P.YS          ; move the turtle
                   ; check pointer's button
 IF P.BUTTON THEN BEEP ELSE FOLLOW
END

; Acknowledge button pushing

TO BEEP
 PRINT1 CHAR 7
END
```

Listing 4. Linking the turtle and the pointer (File: Pointer).

```
; Get 1 point from the user

TO GETPT1
 PU FOLLOW                          ; don't drag your feet
 MAKE "X1 P.XS MAKE "Y1 P.YS        ; remember this spot
 WAITB                              ; wait for button up
END

; Get a 2nd point from the user

TO GETPT2
 MARK                       ; mark the first point
 FOLLOW                     ; follow to the second point
 SETXY :X1 :Y1 MARK         ; and clear the mark on the first
END

; Mark the spot with a small cross hairs

TO MARK
 ST SIZE 2  SHAPE 1 HT   ; shrink the cross, but hide a nothing
 SHAPE :CROSS ST SIZE 4 ; redisplay and expand cross
END

; Wait until user releases the pointers button

TO WAITB
 DIGITIZE IF P.BUTTON THEN WAITB
END
```

Listing 5. Procedures for pointing at points.

```
? MAKE "S5 "RECTANGLE    ; this gives the variable S5 the value "RECTANGLE
? :S5                    ; this shows the value of S5
RESULT: RECTANGLE
? MAKE "N 5              ; this gives the variable N  the value 5
? WORD "S :N             ; this uses N to construct the full variable name
RESULT: S5
? THING WORD "S :N       ; this contstructs the variable name and gets its value
RESULT: RECTANGLE        ; just like the definition of CHOICE
```

Example 5. How the Choice function works.

Listing 6. Final version of menu select program.

```
; MENU SELECTION ROUTINES

; SELECT - MAIN ROUTINE
; ARGUMENTS:
;    :MENU - MENU'S PREFIX CHARACTERS
;    :MSIZE : MENU'S SIZE

TO SELECT :MENU :MSIZE
 TEXTSCREEN CLEARTEXT    :Use a clear textscreen
 PRMENU 0                :Print the MENU
 CHOOSE WAITB            :Let the user select
 OUTPUT  CV              :Output the selected item number
END

; MSIZE - A UTILITY FOR DETERMINING A MENU'S SIZE
; ARGUMENTS: The Menu Prefix and "23"

TO MSIZE :MENU :N
 IF THING? WORD :MENU :N THEN OT :N ELSE OT MSIZE :MENU :N-1
END

; Print the current menu (starting with :N)

TO PRMENU :N
 IF :N > :MSIZE THEN STOP
 PRINT@ 0 :N CHOICE :N
 PRMENU :N+1
END

; Let the user choose an item

TO CHOOSE
 DIGITIZE
 IF NOT P.YC = .CV THEN HILITE MIN :MSIZE P.YC
 IF P.BUTTON THEN BEEP ELSE CHOOSE
END

; Highlight the current item

TO HILITE :Y
 PRINT@ 0 .CV CHOICE .CV          :deHighlight old item
 PRINTI 0 :Y CHOICE :Y            :Highlight new one
END

; Extract and Scale the Pointer's Vertical location to
; the TextScreen's row numbers

TO P.YC    ; This is the HIPAD version
 OUTPUT ABS ( 23 - ROUND ( P.Y * 8.14135N3 ) )
END

TO P.YC    ; This is the joystick version
 OUTPUT ABS ( 23 - ROUND (PADDLE 1) * 8.9843N2
END
TO ABS :X
 IF :X > 0 THEN OUTPUT :X ELSE OUTPUT - :X
END

; Output Smallest of two numbers

TO MIN :X :Y
 IF :X < :Y THEN OUTPUT :X ELSE OUTPUT :Y
END

; Print Z at Location (X,Y)

TO PRINT@ :X :Y :Z
 CURSOR :X :Y
 PRINT1 :Z
END

; Print Z at Location (X,Y) in inverse video

TO PRINTI :X :Y :Z
 .DEPOSIT 232 0          ; some Terrapin LOGO magic numbers
  PRINT@ :X :Y :Z
 .DEPOSIT 232 255
END
```

way to control which shape you are going to draw.

Logo has a Run primitive that lets a program construct and execute another Logo program. You can write a procedure like Draw in Example 4, which lets you mark your points, and then type which shape you want. A lot of switching, from pointing to typing and back to pointing, can get annoying, however. It would be much simpler if you could use the same pointing device that is already in your hand to select which shape is to be drawn.

Menu Selection of Shapes

People who purchase digitizer tablets often receive software that allows them to point at shape names printed on an overlay on the tablet itself and to select a shape to be drawn on the screen.

One problem with adopting this method is that it won't work if you're using a joystick or game paddles. Another is that you have to move your eyes from the screen to the pad and back again, which, if the pad is not positioned directly in front of you, is distracting. A third problem is that different collections of shapes need different overlays, and adding shapes means changing the overlays.

For these reasons, I decided to present a menu of possible shapes on the screen itself and to allow the user to select one using the pointing device. Since the Apple uses two different areas of memory for the text screen

Listing 6 continued.

```
; OUTPUT cursor's row number

TO .CV
 OUTPUT  EXAMINE 37
END

; Output the Nth menu item

TO CHOICE :N
 OUTPUT THING WORD :MENU :N
END

; Erase the Menu Package

TO KILLMENU
 ERASE SELECT
 ERASE MSIZE
 ERASE PRMENU
 ERASE CHOOSE
 ERASE HILITE
 ERASE PRINT@
 ERASE PRINTI
 ERASE .CV
 ERASE CHOICE
 ERASE KILLMENU
END
```

and the graphics screen, you can present a menu on the text screen without disturbing the picture on the graphics screen.

A simple way to allow shape selection would be to maintain an array of procedure names, present it and let the user select which one to run. Logo doesn't have arrays, but it does have lists, so I tried using them. Unfortunately, a problem arose because the selection procedure needed to make frequent use of a procedure that would output the nth element of a list. (This is why the natural data structure is an array.)

In Apple Logo, there is a primitive procedure, Item, that does this, but in Terrapin Logo you have to write the procedure in Logo. The final program ran so slowly that it was just not useful.

The final version of the menu select program (Listing 6) uses another method, somewhat less easy to understand. It has one main procedure, Select, that accepts as input a menu and the number of the last item on it and outputs the number of the selected item. It displays the list on the text screen and lets you select a procedure by moving the pointing device up and down (in the y axis direction). The program highlights which procedure is being pointed at by printing it in inverse video. The final selection is made by pushing the button.

The data structure used for a menu is a set of variables, all beginning with the same letters (as in Shape or just S) and ending with a number (as in S0, S1, S2 and so on). It is the *value* of each variable that is the actual procedure, or menu item, selected.

For example, the value of S0 might be the word Line and the value of S1 might be the word Rectangle. The Select procedure accepts as input just the menu variable prefix and uses the Choice procedure to construct the complete variable name and extract its value. This is a strange procedure that could only have been written in a language like Logo or Lisp. If you have trouble understanding it, typing the dialog in Example 5 might help. If you change to a method of screen highlighting that doesn't require reprinting the procedure's name, you may be able to use lists and avoid this odd procedure.

The rest of the Menu package is fairly straightforward. It makes use of a procedure P.YC, which scales the pointer's range down to the range of numbers used to identify the text screen's rows (0–23). This is similar to the routine that scaled the digitizer's output down to the graphics screen size. Listing 6 contains two versions of this procedure; one for digitizer pads and one for joysticks or paddles. It does use features of Terrapin Logo

Listing 7. The basic Shapes library (File: Shapes).

```
; DRAW A DOT AT (X1,Y1)

TO .DOT :X1 :Y1
 PU SETXY :X1 :Y1
 PD FD 1
END

; DRAW A LINE FROM (X1,Y1) TO (X2,Y2)

TO .LINE :X1 :Y1 :X2 :Y2
 PU SETXY :X1 :Y1
 PD SETXY :X2 :Y2
END

; DRAW A RECTANGLE WITH CORNERS:
; (X1,Y1)(X1,Y2)(X2,Y2)(X2,Y1)

TO .RECTANGLE :X1 :Y1 :X2 :Y2
 PU SETXY :X1 :Y1
 PD SETX :X2 SETY :Y2 SETX :X1 SETY :Y1
END

; DRAW A FILLED RECTANGLE

TO .BLOCK :X1 :Y1 :X2 :Y2
  .RECTANGLE :X1 :Y1 :X2 :Y2       ;draw a rectangle
 PU HT SETX MIN :X1 :X2            ;start at a left corner
 SETY :Y1 SETH 90                  ;pointing to the right
 PD                                ;fill in the rectangle
 REPEAT ABS QUOTIENT :X2 - :X1 2 [SETY :Y2 FD 1 SETY :Y1 FD 1]
 ST SETH 0                         ;show yourself again
END

; DRAW A CIRCLE WITH CENTER (X1,Y1)
; AND CIRCUMFERENCE PASSING THROUGH
; (X2,Y2)

TO .CIRCLE :X1 :Y1 :X2 :Y2
 PU SETXY :X2 :Y2                  ;position turtle on circumference
 SETH ( TOWARDS :X1 :Y1 ) - 90     ;facing to the left of the center
 PD HT                             ;draw the circle
 RCIRCLE DISTANCE :X1 - :X2 :Y1 - :Y2
 ST                                ;show yourself again
END

; DRAW A FILLED CIRCLE

TO .FCIRCLE :X1 :Y1 :X2 :Y2
  .CIRCLE :X1 :Y1 :X2 :Y2          ;first draw a circle
                                ;then fill it in
 FRCIRCLE DISTANCE :X1 - :X2 :Y1 - :Y2
END

; Draw a circle to the right

TO RCIRCLE :SIZE
 MAKE "SIZE :SIZE * 8.72662N2
 RT 2.5
 REPEAT 72 [FD :SIZE RT 5]
 LT 2.5
END

; Fill in a circle

TO FRCIRCLE :R
 HT PD   ;Prepare turtle
         ;calculate circumference arcs, angle increments, and
          diameter
 FRCIRCLE1 :R*8.72662N1/:R :R*2 (25/:R) ;draw it
 ST      ;show turtle
END

TO FRCIRCLE1 :S :D :A
 RT :A
 REPEAT 90/:A [FD :S RT (90+:A) FD :D RT (90+:A)]
END
```

More

Listing 7 continued.

```
TO DISTANCE :X :Y
 OUTPUT SQRT ( :X * :X + :Y * :Y )
END

TO MIN :X :Y
 IF :X < :Y THEN OUTPUT :X ELSE OUTPUT :Y
END

TO ABS :X1
 IF :X1 < 0 THEN OUTPUT ( - :X1 ) ELSE OUTPUT :X1
END
```

Listing 8. The sketch program (File: Sketch).

```
. LOGO/HIPAD SKETCH PROGRAM

. SKETCH - MAIN ROUTINE. BEGINS
.  SKETCHING PROGRAM

TO SKETCH
 FULLSCREEN RESET                    ;adopt clear graphics screen
 DOTS                                ;start in DOT mode
 MAKE "S SIZE MSIZE "S 23            ;calculate menu size
 SETSHAPE  CROSS SIZE 4              ;use a size 4 cross hairs
 SKLOOP
END

. SKLOOP - THE SKETCH CONTROL LOOP
.  A Good Place to restart if something went wrong and you
. don't want to lose the picture

TO SKLOOP
 GETPT1              ;get first point
                     ;if not at left margin, run current mode procedure
                     ;else offer the menu
 IF P XS > -137 THEN RUN  MODE ELSE SKRUN SELECT "S :S SIZE
 SKLOOP
END

. RUN the selected procedure with the graphics screen

TO SKRUN  N
 FULLSCREEN
 RUN (LIST THING WORD "S  N)
 FULLSCREEN
END

. THE INITIAL SKETCH MENU

MAKE "S0 "QUIT                       ;exit program
MAKE "S1 "CLEAR                      ;clear the screen
MAKE "S2 "DOTS                       ;select DOT mode
MAKE "S3 "LINES                      ;select LINE mode
MAKE "S4 "CIRCLES                    ;select CIRCLE mode
MAKE "S5 "'SHADED CIRCLES'           ;select SHADED CIRCLE mode
MAKE "S6 "RECTANGLES                 ;select RECTANGLE mode
MAKE "S7 "'SHADED RECTANGLES'        ;select SHADED RECTANGLE mode
MAKE "S8 "'PEN COLOR'                ;change pen color
MAKE "S9 "'BACKGROUND COLOR'         ;change background color
MAKE "S10 "'SAVE PICTURE'            ;save picture
MAKE "S11 "'RETRIEVE PICTURE'        ;reload picture

. QUIT - EXIT THE SKETCH PROGRAM
TO QUIT
 SETSHAPE 0 SIZE 1          ;restore the turtle
 RESET                      ;reset the graphics screen
 NODRAW                     ;return to text screen
 TOPLEVEL
END

. CLEAR - CLEAR THE PICTURE
TO CLEAR
 CS BG 0 PC 1
END

. DOTS - SET MODE TO DOTS
TO DOTS
 MAKE "MODE [ DOT  X1  Y1]
END
```

More

(inverse video printing, cursor manipulation and so on), which are no doubt available in Apple Logo but which will have to be changed to work properly.

The Select routine returns the number of the selected item and not the actual item variable or variable value because Select is used for more than just selecting procedures. It is a self-contained package that is used in several programs. The Menu file also contains a procedure, MSize, that determines the size of a menu by constructing variables and checking them for values using the Thing? primitive until an undefined variable is encountered.

Putting It Together

It's easy at this point to get a drawing program running, although it is important to be careful in order to make it easy to change later. Some desired features include:

- An easy way to display the menu of shapes without disturbing the picture;
- A library of shapes that can be easily extended;
- A default mode of operation (*that* is, once you ask to draw lines, you continue drawing lines until you ask for something else).

The sketch program is fun to use; it can save pictures on disk and it's easily extended.

The menu-call technique I used has the user moving the pointer to the far left-hand side of the screen and pressing the button. This means that you can't mark the first point of an object at the far left margin, a minor limitation. If your pointer has two buttons, or if you're using two game control paddles, you might use the second button to call up the menu. Or, you can use the keyboard to call for it (use the RC? procedure and press return).

The library of basic shapes was put in a separate Logo file (Listing 7). The library is a set of procedures that accepts either one or two points as input

and draws a shape at the specified point. The basic library contains Dot, Line, Rectangle, Block (a filled Rectangle), Circle and FCircle, a solid, colored Circle.

The only complex procedure in the collection is FCircle. It works by having the turtle draw diameters through the circle as it crawls around the circumference. The size of the step the turtle takes around the perimeter of the circle decreases as the circle gets larger in order to avoid blank streaks between the diameters. (The step size should be large for small circles; otherwise it takes an uncomfortably long time to draw them.)

The procedures selected by the user aren't the Shape procedures themselves but ones that make these Shape procedures the default mode of operation (until a new procedure is selected).

Sketchy Details

Listing 8 shows this version of the Sketch package. Note that it includes utility procedures such as Quit (exit the program), Clear (the screen), Save Picture and Load Picture and (change) Pen Color and Background Color, all of which are trivially easy to add once the basic system is devised. The pen and background color procedures use the Menu Select routines to let you choose a new color using the same technique as selecting a new default shape.

Because Logo saves its pictures in the standard Apple picture format, any dot matrix graphics printer with screen dump software can be used to print pictures.

The complete package now extends over several files and takes time to load. I wrote a loading procedure and stuck it on its own self-starting file (Listing 9).

As it stands now, the Sketch program is fun to use; it can save pictures on disk and it's easily extended. To add new shapes to the menu, you simply add a shape to the shape library, define a procedure like Lines, which sets the system's Mode variable to a procedure that invokes the new shape, and add a new menu variable whose value is that procedure.

Many shape procedures can be "pure turtle" procedures using the x and y coordinates given to them for a starting point and direction (start at the first point, pointing at the second). The Sketch package then turns out to be a nice place to store your favorite Logo picture procedures. (I have worked out some shapes for electronic schematic symbols and for welding symbols. The trick is to use the two points that you mark not only to indicate the beginning and ending of a picture, but also to determine an appropriate scale for the symbol.)

If you have an extra keypad, you might put labels on it and use it, instead of the menu package, to select which picture to draw. If you want more than the maximum number of 24 menu items allowed by this system, you can modify it to use three columns of items instead of just one. Or, you might use multiple menus,

Listing 8 continued.

```
; LINES - SET MODE TO LINES
TO LINES
 SETMODE " LINE
END

; CIRCLES - SET MODE TO CIRCLES
TO 'CIRCLES'
 SETMODE " CIRCLE
END

; SHADED CIRCLES - SET MODE TO SHADED CIRCLES
TO 'SHADED CIRCLES'
 SETMODE " FCIRCLE
END

; RECTANGLES - SET MODE TO RECTANGLES
TO RECTANGLES
 SETMODE " RECTANGLE
END

; SHADED RECTANGLES - SET MODE TO SHADED RECTANGLES
TO 'SHADED RECTANGLES'
 SETMODE " BLOCK
END

; SETMODE - SET MODE TO [GETPT2 :FN :X1 :Y1 P.XS P.YS]
; USED BY ALL TWO DIMENSIONAL SHAPE MODES

TO SETMODE :FN
 MAKE "MODE (FPUT "GETPT2 (FPUT :FN [:X1 :Y1 P.XS P.YS]))
END

; CHANGE PEN COLOR
TO 'PEN COLOR'
 PC COLOR
END

; CHANGE BACKGROUND COLOR
TO 'BACKGROUND COLOR'
 BG COLOR
END

; USE COLOR MENU TO SELECT A COLOR
TO COLOR
 OUTPUT SELECT "C 5
END

; SAVE BINARY PICTURE
TO 'SAVE PICTURE'
 SAVEPICT GETNAME
END

; RETRIEVE BINARY PICTURE
TO 'RETRIEVE PICTURE'
 RESET READPICT GETNAME
END

TO GETNAME
 TEXTSCREEN
 PRINT1 "' ENTER PICTURE NAME
 OUTPUT FIRST REQUEST
END

; THE COLOR MENU

MAKE "C0 "BLACK
MAKE "C1 "WHITE
MAKE "C2 "GREEN
MAKE "C3 "VIOLET
MAKE "C4 "ORANGE
MAKE "C5 "BLUE
```

selecting one menu from within another.

Another extension, a little more difficult, would be to write procedures that allow you to specify three points instead of just two, then to use the points to draw curves, such as circular arcs or parts of parabolas.

Our next step was to try to connect a digital plotter (instead of a dot matrix printer) to the program. I found that there was no easy way to do it.

A plotter is not a raster- or dot-oriented device; it's more like the Logo turtle in that it can take commands to move from place to place, either dragging its pen on the paper or not.

There is no reasonable way, however, to convert the binary image of the Apple graphics screen to a set of plotter commands. The solution, described in part 2 of this article, led me to adapt Turtle graphics to the plotter and convert the Sketch package into an automatic programming system.■

```
TO LOADSKETCH
 READ "POINTER
 READ "MENU
 READ "CURS.AUX
 READ "SHAPES
 READ "SKETCH
 DOS [BLOAD INTERFACE.BIN]
 ERASE LOADSKETCH
END

LOADSKETCH          ;this is a self starting file
```

Listing 9. The Sketch package loader (File: Draw).

Making Room

The Terrapin Logo assembler is a fairly large Logo program. Consequently, once it is loaded, there isn't much room left in memory for the routine you want to assemble.

For the HiPad interface, this meant I had to break the machine-language routines into two parts, as shown in Listing 2.

In order to allow the second part of the program to reference labels defined in the first part, I modified the Logo assembler slightly:

1) I deleted the routine ERNS, which erases the labels on the Labels list.

2) I deleted the first line of the procedure Assemble, which checks the variable Labels and erases its current value.

3) I also added the statement

MAKE "ROR [IMP 106]

to the file Opcodes.Logo, which allowed us to use the 6502 right rotate instruction.

R.F.

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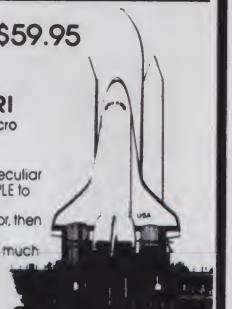
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Breakeven program (July 1983 Microcomputing, p. 74) converted for Heath H89 users; it's written in MBasic. Conversion by Jeffrey Jones, 28H Flintlock Road, Ledyard, CT 06339.

```
100 E$=CHR$(27):CS$=E$+"E":RV$=E$+"p":NV$=E$+"q":CD$=E$+"B":CS$=CD$+CD$+CD$+CD$+CD$+
CD$
110 DIM C(21):REM DIMENSIONS COST FIGURE TABLE
120 PRINT CS$:PRINT:GOSUB 1910:PRINT
130 PRINT
140 PRINT "ANSWER 1 TO SKIP THE INSTRUCTIONS"
150 PRINT "AND GO RIGHT TO THE DATA-ENTRY AREA."
160 PRINT
170 PRINT "ANSWER 2 TO SEE THE INSTRUCTIONS"
180 PRINT "AND THEN ENTER DATA."
190 PRINT:PRINT "ANSWER 3 TO STOP NOW.":PRINT
200 INPUT "";O
210 IF O<1 OR O>3 THEN 120
220 IF O=1 THEN 850
230 IF O=2 THEN 240 ELSE PRINT"END OF PROGRAM":END
240 PRINT CS$:PRINT:GOSUB 1910:
250 PRINT"THIS PROGRAM WILL ALLOW YOU TO ENTER"
260 PRINT"YOUR SALES VOLUME AND COST DATA, AND"
270 PRINT"THEN WILL PRINT A CHART FOR YOU, BASED"
280 PRINT"ON YOUR OWN INFORMATION."
290 PRINT
300 PRINT"TO KEEP THINGS SIMPLE, WE"
310 PRINT"ONLY ENTER YOUR TOTAL SALES VOLUME, AND"
320 PRINT"THE TOTAL OF YOUR 'COST OF SALES.'"
330 PRINT
340 PRINT"THIS INCLUDES YOUR YOUR DIRECT COSTS, SUCH"
350 PRINT"AS LABOR AND MATERIALS. YOU ARE ALSO"
360 PRINT"ASKED TO ENTER YOUR OVERHEAD COSTS"
370 PRINT
380 PRINT"THE TOTAL OF THESE TWO - DIRECT COSTS"
390 PRINT"AND OVERHEAD COSTS - WILL BE"
400 PRINT"YOUR TOTAL 'COST OF SALES'
410 PRINT:GOSUB 1910:
420 PRINT"HIT ANY KEY TO CONTINUE... ":A$=INPUT$(1)
430 PRINT CS$:PRINT:GOSUB 1910:
440 PRINT"YOUR SALES DATA WILL BE PRINTED IN"
450 PRINT"SEVEN COLUMNS, WITH THE INITIAL "
460 PRINT" 'STARTING SALES' IN THE CENTER. THEN,"
470 PRINT"SINCE YOU WERE ASKED FOR A PERCENTAGE"
480 PRINT"INCREASE/DECREASE FIGURE, THE COLUMNS"
490 PRINT"TO THE RIGHT AND LEFT OF THE 'STARTING'"
500 PRINT"SALES COLUMN WILL SHOW THIS AMOUNT"
510 PRINT"INCREASED (RIGHT SIDE) AND DECREASED"
520 PRINT"(LEFT SIDE) BY THE PERCENTAGE YOU "
530 PRINT"SPECIFIED."
540 PRINT
550 PRINT"THIS IS A CUMALATIVE PERCENT, BY THE"
560 PRINT"WAY, SO YOU CAN EASILY SEE WHAT "
570 PRINT"HAPPENS TO YOUR SALES IF THEY INCREASE"
580 PRINT"OR DECREASE BY THE % YOU ENTERED"
590 PRINT: GOSUB 1910:  PRINT
600 PRINT"HIT ANY KEY TO CONTINUE...":A$=INPUT$(1)
610 PRINT CS$:  PRINT : GOSUB 1910:  PRINT
620 PRINT"YOUR COST INFORMATION IS TOTALED."
630 PRINT"YOU ARE ALSO ASKED TO ENTER A PERCENT"
640 PRINT"THAT YOU'D LIKE TO SEE YOUR COSTS"
650 PRINT"INCREASE OR DECREASE."
660 PRINT
670 PRINT"THIS INFORMATION IS PRINTED AS THE"
680 PRINT"LEFT-HAND COLUMN OF YOUR PRINTOUT,"
690 PRINT"AND - LIKE THE SALES FIGURES - HAS "
700 PRINT"YOUR STARTING 'COST' AMOUNT IN THE"
710 PRINT"CENTER OF THE NUMBERS, WITH THE TOTALS"
720 PRINT"FOR YOUR COSTS INCREASING (GOING DOWN"
730 PRINT"THE CHART) AND DECREASING (GOING UP"
740 PRINT"THE CHART) ACCORDING TO THE PERCENT"
750 PRINT"YOU SPECIFIED TO START WITH."
760 PRINT: GOSUB 1910: PRINT
770 PRINT"HIT ANY KEY TO CONTINUE...": A$=INPUT$(1)
780 PRINT CS$:PRINT:GOSUB 1910:PRINT
790 PRINT"BY READING ACROSS FOR SALES AND THEN"
800 PRINT"DOWN THE LEFT-HAND COLUMN FOR COSTS"
810 PRINT"YOU CAN DETERMINE YOUR PROFIT OR LOSS"
820 PRINT"BASED ON WHAT MAY HAPPEN TO YOUR BUSINESS"
830 PRINT:GOSUB 1910:PRINT
840 PRINT"HIT ANY KEY TO START... ":A$=INPUT$(1)
850 PRINT CS$:PRINT:GOSUB 1910:PRINT:PRINT
860 PRINT"STARTING FIGURE MUST BE A POSITIVE NUMBER !!!! ":PRINT:PRINT
870 INPUT "STARTING SALES VOLUME ";S(4)
880 IF S(4)<=0 THEN 850
890 PRINT CS$:PRINT:GOSUB 1910:PRINT:PRINT
900 PRINT"NOW ENTER THE PERCENT"
910 INPUT "INCREASE/DECREASE FOR EACH PERIOD ? ";PS
920 IF PS<=1 THEN GOTO 930 ELSE PS=PS/100
930 IF PS<0 OR PS>100 THEN 900
940 PRINT CS$:PRINT:GOSUB 1910:PRINT:PRINT
950 INPUT "DIRECT COSTS ";D
960 PRINT CS$:PRINT:GOSUB 1910:PRINT:PRINT
970 INPUT "OVERHEAD COSTS ";O
980 C(11)=O+D:REM C(11) TOTAL COST TO START
990 IF C(11)>=1 THEN 1040
1000 PRINT CS$;CS$;"YOUR DIRECT COSTS + OVERHEAD "
1010 PRINT"COSTS TOTAL LESS THAN ZERO."
1020 PRINT:PRINT"THEY MUST BE A POSITVE FIGURE.";PRINT
1030 PRINT"ENTER ANY KEY TO START OVER ";:A$=INPUT$(1):GOTO 890
1040 PRINT CS$:PRINT:GOSUB 1910:PRINT:PRINT
1050 PRINT"TO GET YOUR COST FIGURES TO GO"
1060 PRINT"UP AND DOWN THE SIDE OF YOUR PRINTOUT,"
1070 PRINT"WE NEED TO ENTER THE PERCENT YOU'D"
1080 PRINT"LIKE TO SEE THESE FIGURES "
1090 PRINT"INCREASE/DECREASE."
1100 PRINT:PRINT
1110 PRINT:INPUT "PERCENT INCREASE/DECREASE ";PC
1120 IF PC<=1 THEN GOTO 1130 ELSE PC=PC/100
1130 IF PC<0 OR PC>100 THEN 1040
1140 REM FIGURE SALES ACCOUNTS USING VARIABLES
1150 REM S(1) THRU S(7)---S(4) INPUTTED SALES AMOUNT
1160 S(5)=(1+PS)*S(4)
1170 S(6)=(1+PS)*S(5)
1180 S(7)=(1+PS)*S(6)
1190 REM DECREASE THE AMOUNTS
1200 S(3)=(1-PS)*S(4)
```

Listing continued

```
1210 S(2)=(1-PS)*S(3)
1220 S(1)=(1-PS)*S(2)
1230 REM FIGUE AMOUNTS OF COST FIGURE
1240 REM C(11) STARTING COST TOTAL
1250 REM INCREASED COST FIRST
1260 FOR Y=12 TO 21
1270 C(Y)=(1+PC)*C(Y-1)
1280 NEXT Y
1290 REM DECREASED COSTS
1300 FOR Y=10 TO 1 STEP -1
1310 C(Y)=(1-PC)*C(Y+1)
1320 NEXT Y
1330 FOR X=1 TO 7
1340 S(X)=INT(S(X))
1350 NEXT X
1360 FOR Y=1 TO 21
1370 C(Y)=INT(C(Y))
1380 NEXT Y
1390 REM ** PRINT DATA **
1400 PRINT CS$:PRINT:GOSUB 1910:PRINT:PRINT
1410 PRINT"ENTER TODAY'S DATE, PLEASE ";:LINE INPUT "";D$
1420 PRINT:PRINT"ENTER A 1-TO PRINT OR A 2-TO END NOW ..... "
1425 PRINT"***** PRINTER READY *****"
1430 A$=INPUT$(1): IF A$="1" THEN 1440 ELSE IF A$="2" THEN END
1435 IF A$<1 OR A$>2 THEN 1420
1440 REM :PRINTING SECTION
1450 LPRINT
1460 LPRINT"       >>>>>> BREAKEVEN CHART <<<<<<
1470 LPRINT:LPRINT
1480 LPRINT"THIS REPORT WAS PRINTED ON ";D$;"."
1490 LPRINT:LPRINT"TO READ THIS CHART, FIND THE SALES FIGURE YOU WANT ON THE "
1500 LPRINT"TOP LINE, AND THEN LOOK DOWN THE LEFT SIDE, THE COST LINE, UNTIL YOU
"
1510 LPRINT"FIND THE COST YOU WANT. THE FIGURE WHERE THE LINES"
1520 LPRINT"INTERSECT IS YOUR PROFIT OR LOSS BASED ON YOUR SALES AND COSTS."
1530 LPRINT:LPRINT:LPRINT"THE INITIAL SALES VOLUME IS $ ";INT(S(4));"."
1540 LPRINT"THE RATE OF INCREASE/DECREASE IS ";INT (100*PS);" %."
1550 LPRINT
1560 LPRINT"THE TOTAL STARTING COSTS ARE $ ";INT (C(11));"."
1570 LPRINT"AND THE COSTS ARE INCREASING/DECREASING AT THE RATE OF ";INT(100*PC)
;" %."
1580 LPRINT STRING$(79,"-")
1590 LPRINT
1600 LPRINT"DIRECT COSTS"
1610 LPRINT"PLUS OVERHEAD "
1620 LPRINT"     !"
1630 LPRINT"     !        SALES VOLUME --->"
1640 LPRINT"     V"
1650 LPRINT "          "
1660 FOR X=1 TO 7
1670 Z9=S(X):GOSUB 1920
1680 Q9=LEN(Z9$)
1690 A=A+10
1700 LPRINT TAB(A+6-Q9)Z9$;
1710 NEXT
1720 LPRINT " "
1730 LPRINT "          ";:LPRINT STRING$(70,"-");
1740 LPRINT " "
1750 FOR Y=1 TO 21
1760 Z9=C(Y):GOSUB 1920
1770 C$=Z9$
1780 K9=LEN(C$)
1790 FOR X=1 TO 7
1800 Z9=S(X)-C(Y):GOSUB 1920
1810 Q9=LEN(Z9$)
1820 IF X=1 THEN LPRINT TAB(B-K9)C$+" !";
1830 B=B+10
1840 LPRINT TAB(B+6-Q9)Z9$;
1850 NEXT X
1860 B=0
1870 NEXT Y
1880 LPRINT TAB(10);STRING$(70,"-");
1890 LPRINT " "
1900 PRINT CS$;"END OF PROGRAM":END
1910 PRINT RV$:PRINT"          >>>>>> BREAKEVEN <<<<<<          ";PRINT NV$:RETUR
N
1920 Z9=INT(Z9)
1930 Z9$=STR$(Z9):RETURN
                    >>>>>> BREAKEVEN CHART <<<<<<


THIS REPORT WAS PRINTED ON 22 JUNE 1983.

TO READ THIS CHART, FIND THE SALES FIGURE YOU WANT ON THE
TOP LINE, AND THEN LOOK DOWN THE LEFT SIDE, THE COST LINE, UNTIL YOU
FIND THE COST YOU WANT. THE FIGURE WHERE THE LINES
INTERSECT IS YOUR PROFIT OR LOSS BASED ON YOUR SALES AND COSTS.


THE INITIAL SALES VOLUME IS $  100000 .
THE RATE OF INCREASE/DECREASE IS  10  %.

THE TOTAL STARTING COSTS ARE $  95000 .
AND THE COSTS ARE INCREASING/DECREASING AT THE RATE OF  5  %.
-------------------------------------------------------------------------------

DIRECT COSTS
PLUS OVERHEAD
     !
     !        SALES VOLUME --->
     V
          72900     81000     90000     100000    110000    121000    133100
     -------------------------------------------------------------------------
  56880 ! 16020     24120     33120     43120     53120     64120     76220
  59873 ! 13027     21127     30127     40127     50127     61127     73227
  63024 !  9876     17976     26976     36976     46976     57976     70076
  66342 !  6558     14658     23658     33658     43658     54658     66758
  69833 !  3067     11167     20167     30167     40167     51167     63267
  73509 !  -609      7491     16491     26491     36491     47491     59591
  77378 ! -4478      3622     12622     22622     32622     43622     55722
  81450 ! -8550      -450      8550     18550     28550     39550     51650
  85737 !-12837     -4737      4263     14263     24263     35263     47363
  90250 !-17350     -9250      -250      9750     19750     30750     42850
  95000 !-22100    -14000     -5000      5000     15000     26000     38100
  99749 !-26849    -18749     -9749       251     10251     21251     33351
 104737 !-31837    -23737    -14737     -4737      5263     16263     28363
 109974 !-37074    -28974    -19974     -9974        26     11026     23126
 115473 !-42573    -34473    -25473    -15473     -5473      5527     17627
 121246 !-48346    -40246    -31246    -21246    -11246      -246     11854
 127309 !-54409    -46309    -37309    -27309    -17309     -6309      5791
 133674 !-60774    -52674    -43674    -33674    -23674    -12674      -574
 140358 !-67458    -59358    -50358    -40358    -30358    -19358     -7258
 147376 !-74476    -66376    -57376    -47376    -37376    -26376    -14276
 154744 !-81844    -73744    -64744    -54744    -44744    -33744    -21644
     -------------------------------------------------------------------------
```

Speak Easy And Carry a Big Digitizer

This short program will provide you with a voice digitizer for your TRS-80 Model III.

By Greg Rogers

Speak-Easy is a voice digitizer for the TRS-80 Model III. It comes in two modules and requires 48K RAM, the Radio Shack Editor/Assembler, a mini-amplifier, speaker and one disk drive.

The first module takes sound input from a cassette microphone, digitizes it and gives you the option of saving the phrase on disk; later, it will be played back by the second module. The second module, a Basic enhancer, allows you to play back a previously saved voice module created by the first program. The enhancer adds two new commands to the Basic library. The first, CMD/S(nn), allows you to change the speed at which the voice module will play back (nn should be somewhere between 1-15, 1 being the fastest and 15 being the slowest). The second command, CMD/T, plays back the voice module.

First Things First

The first program begins by clearing the screen, printing the program title and asking you to press a key and speak. The program then waits for a key to be pressed.

The BC register pair is initialized with the number of bytes input from the cassette. HL is set to the beginning of the buffer where the talk data will be stored. The cassette microphone (port 255) reads each byte and stores it in the buffer. A delay is made here. Although the delay decreases voice clarity during replay; it's necessary—without it, one or two words would take up all available memory. By adding a delay, a sentence or more can be input at one time.

Next, BC is decremented; the point in the buffer is incremented; and the loop repeats until BC is equal to zero. At this point, a "Buffer is Full" message is displayed and the computer waits for another key to be pressed.

An almost identical loop is used to replay the voice except that each byte is now read from the buffer and sent back to the port. Next, you are asked if you would like to save the talk data on disk or if you would like to try again. At this point, you may press Clear to exit from the program. You are asked for the filespec, and the data is dumped to disk.

> The Speak-Easy's voice clarity is good enough to add that special touch to your Basic programs.

A voice module that was saved from this program is needed. Go to Basic and type:

```
CMD"L","the filespec of the voice module saved above"
CMD"L","the filespec of program listing #2"
DEFUSR=&H7000:X=USR(0)
```

Ready to Go

The module is now ready to use. The program begins by changing the jump vector of the CMD command so that it points to the Check routine. Now, every time the Basic interpreter encounters the command "CMD," there's a jump to the Check routine. It then replaces the entry address to the initialization program with a return command (C9 hex or 201 decimal) so that it cannot again be executed via X=USR(0).

The Check routine begins by checking for the /. Since this is the sign for division, it's treated specially—the Basic interpreter decodes it into 0D0 hex (208 decimal) instead of its ASCII value of 2F hex (47 decimal).

If the character checked is not a /, then control returns to the Basic interpreter and a syntax error occurs. Otherwise, both a T and an S, the legal commands, are checked for. If one is found, the program will jump to the correct routine to handle the command.

The Talk routine is the same as the

Address correspondence to Greg Rogers, 912 South Chester Road, West Chester, PA 19380.

Output routine in Listing 1 except for the Delay routine. Instead of delaying for a fixed amount of time, the routine delays for the amount specified in DELA.

The Speed routine checks for a (and returns to the Basic interpreter if one isn't found. It then moves to the next character, which should be the first digit in an eight-bit number that specifies the new speed for voice module playback.

A routine is called in the ROM at 2B1C hex (11036 decimal), which converts an ASCII string pointed to by HL

```
00100 ;
00110 ;
00120 ;               PROGRAM LISTING # 1
00130 ;               CREATES MODULES OF SPEAK DATA
00140 ;
00150 ;
00160                 ORG     7000H                   ;ORIGINATE AT 7000H
00170 BUFF    FILE1   DEFS    2                       ;STORAGE BUFFER
00180 FILE1   DEFM    'FILENAME? '                    ;FILENAME PROMPT
00190                 DEFB    3
00200 DUMP1   DUMP    DEFM    'DUMP '                 ; 'DUMP' COMMAND
00210 FILE    FILE    DEFM    '                '
00220                 DEFM    ' (START=8000,END=0E000)
00230                 DEFB    13
00240 ;
00250 ;
00260 ;               DELAY ROUTINE
00270 ;
00280 ;
00290 DELAY   LD      B,10                    ;LOOP 10 TIMES
00300 DELP    DJNZ    DELP                    ;DO IT
00310         RET                             ;RETURN TO CALLER
00320 VDPUT   LD      A,(HL)                  ;GET CHARACTER
00330         OR      A                       ;IS IT ZERO?
00340         RET     Z                       ;RETURN IF SO
00350         LD      (DE),A                  ;PUT ON SCREEN
00360         INC     HL                      ;NEXT CHARACTER
00370         INC     DE                      ;NEXT SCREEN POSITION
00380         JR      VDPUT                   ;LOOP UNTIL DONE
00390 BUFFER  EQU     8000H                   ;START OF SPEAK BUFFER
00400 ;
00410 ;
00420 ;               IMPORTANT MESSAGES
00430 ;
00440 ;
00450 MSG1    DEFM    'SPeech - by Greg Rogers'
00460         NOP
00470 MSG2    DEFM    'Press any key and SPEAK'
00480         NOP
00490 MSG3    DEFM    'Buffer is full.  Press any key to replay.'
00500         NOP
00510 MSG4    DEFM    'Press ENTER to dump to disk, any other key to try again.'
00520         NOP
00530 MSG5    DEFM    'Another Phrase (Y OR N)? '
00540         DEFB    3
00550 ;
00560 ;
00570 ;               SET-UP CODE
00580 ;
00590 ;
00600 START   CALL    01C9H                   ;CLEAR SCREEN
00610         LD      HL,BUFFER               ;POINT TO BUFFER START
00620         LD      DE,BUFFER+1             ;POINT TO BUFFER+1
00630         LD      BC,5FFFH                ;NUMBER OF BYTES TO CLEAR
00640         LD      (HL),0                  ;CLEAR A BYTE
00650         LDIR                            ;LOOP UNTIL DONE
00660         LD      HL,MSG1                 ;FIRST MESSAGE
00670         LD      DE,15360                ;WHERE TO PUT IT
00680         CALL    VDPUT                   ;PUT IT THERE
00690         LD      HL,MSG2                 ;SECOND MESSAGE
00700         LD      DE,15360+64             ;WHERE TO PUT IT
00710         CALL    VDPUT                   ;PUT IT THERE
00720 ;
00730 ;
00740 ;               START OF MAIN PROGRAM
00750 ;
00760 ;
00770 INPUT   LD      A,(3840H)               ;READ KEYBOARD
00780         OR      A                       ;IS IT ZERO?
00790         JR      Z,INPUT                 ;LOOP IF SO
00800         LD      BC,6000H                ;NUMBER OF BYTES
00810         LD      HL,BUFFER               ;START OF BUFFER
00820 LOOP1   IN      A,(0FFH)                ;GET A BYTE FROM CASSETTE
00830                                         ;MICROPHONE
00840         LD      (HL),A                  ;STORE IT IN BUFFER
00850         PUSH    BC                      ;SAVE BYTE COUNTER
00860         PUSH    HL                      ;SAVE BUFFER POSITION
00870         CALL    DELAY                   ;WAIT A WHILE
00880         POP     HL                      ;RESTORE BUFFER POSITION
00890         POP     BC                      ;RESTORE BYTE COUNT
00900         INC     HL                      ;INC. BUFFER POSITION
00910         DEC     BC                      ;DECREMENT BYTE COUNT
00920         LD      A,B                     ;TEST FOR ZERO
00930         OR      C
00940         JR      NZ,LOOP1                ;LOOP IF NOT
00950         LD      HL,MSG3                 ; 'BUFFER FULL' MESSAGE
00960         LD      DE,15360+128            ;WHERE TO PUT IT
00970         CALL    VDPUT                   ;PUT IT THERE
00980 ;
00990 ;
01000 ;               REPLAY VOICE
01010 ;
01020 ;
01030 OUTPUT  LD      A,(3840H)               ;READ FROM KEYBOARD
01040         OR      A                       ;IS IT ZERO?
01050         JR      Z,OUTPUT                ;LOOP IF SO
01060         LD      BC,6000H                ;NUMBER OF BYTES
01070         LD      HL,BUFFER               ;START OF BUFFER
01080 LOOP3   LD      A,(HL)                  ;GET TALK BYTE
01090         OUT     (255),A                 ;OUT TO SPEAKER
01100         PUSH    HL                      ;SAVE BUFFER POSITION
01110         PUSH    BC                      ;SAVE BYTE COUNT
01120         CALL    DELAY                   ;WAIT A BIT
01130         POP     BC                      ;RESTORE BYTE COUNT
01140         POP     HL                      ;RESTORE BUFFER POSITION
01150         INC     HL                      ;INC. BUFFER POSITION
01160         DEC     BC                      ;DECREMENT BYTE COUNT
01170         LD      A,B                     ;IS IT ZERO?
01180         OR      C
01190         JR      NZ,LOOP3                ;LOOP IF NOT
01200         LD      HL,MSG4                 ;DUMP TO DISK?
01210         LD      DE,15360+192            ;WHERE TO PUT QUESTION
01220         CALL    VDPUT                   ;DO IT
01230 LOOP    LD      A,(3840H)               ;READ FROM KEYBOARD
01240         OR      A                       ;IS IT ZERO?
01250         JR      Z,LOOP                  ;LOOP IF SO
01260         BIT     0,A                     ;IS IT THE ENTER KEY?
01270         JR      NZ,DUMP                 ;GO IF SO
01280         BIT     1,A                     ;IS IT THE CLEAR KEY?
01290         RET     NZ                      ;EXIT IF SO
01300         JR      START                   ;DO IT ALL AGAIN
01310 ;
01320 ;
01330 ;               SAVE TALK DATA
01340 ;
01350
```

Listing 1. Speak-Easy voice digitizer creates speak data modules.

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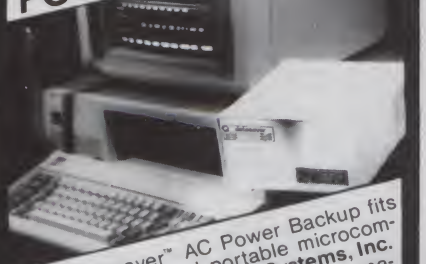
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to an eight-bit value and stores the result in A. The new value is then stored in DELA. The end-parenthesis is checked for and control is returned to Basic.

To set up a cassette recorder to accept sound input, remove all of the plugs except the ear plug. Press the eject button and remove any tapes. At the upper left-hand corner inside the cassette recorder should be a small button. Press this button, and press Play/Record. Now all you have to do is speak into the microphone and it will pick up your voice.

Although voice clarity isn't perfect, it should be good enough to add that special touch to your Basic programs.■

```
00100 .
00110 .
00120 .                 PROGRAM LISTING #2
00130 ;                 BASIC ENHANCER THAT ADDS TWO COMMANDS TO
00140 .                 BASIC "CMD'T" AND "CMD'S(nn)". ALLOWS YOU
00150 ;                 TO USE SPEECH MODULES YOU CREATED USING
00160 .                 PROGRAM LISTING #1 IN YOUR BASIC PROGRAMS
00170 ;
00180 ;
00190           ORG     07000H                  ;ORIGINATE AT 7000H
00200 CMD       EQU     4174H                   ;JUMP VECTOR
00210 VDLINE    EQU     021BH                   ;VDLINE LINE ROM ROUTINE
00220 ;
00230 ;
00240 ;                 INITIALIZATION
00250 .
00260 .
00270 START     LD      HL,(CMD)                ;CURRENT VALUE IN VECTOR
00280           LD      (OLD),HL                ;SAVE IT
00290           LD      HL,CHECK                ;NEW JUMP VECTOR
00300           LD      (CMD),HL                ;STORE IT
00310           LD      A,201                   ;CODE FOR 'RETURN'
00320           LD      (START),A               ;STORE IT
00330           LD      HL,MSG1                 ;FIRST MESSAGE
00340           JP      VDLINE                  ;PUT IT ON
00350 MSG1      DEFM    'SPEAK-EASY IS NOW INSTALLED'
00360           DEFB    13
00370 .
00380 .
00390 .                 CHECK FOR A SPEAK-EASY COMMAND
00400 ;
00410 ;
00420 CHECK     LD      A,(HL)                  ;GET CHARACTER
00430           CP      0D0H                    ;IS IT A DECODED '/'?
00440           DEFB    0C2H                    ;RETURN IF NOT
00450 OLD       DEFW    0                       ;WHERE TO GO
00460           RST     10H                     ;NEXT CHARACTER
00470           LD      A,(HL)                  ;GET CHARACTER
00480           CP      'T'                     ;IS IT A 'T'?
00490           JR      Z,TALK                  ;MAKE NOISE IF SO
00500           CP      'S'                     ;IS IT A 'S'?
00510           JR      Z,SPEED                 ;CHANGE SPEED IF SO
00520           RET                             ;RETURN
00530 DELA      DEFB    10                      ;SPEED
00540 ;
00550 ;
00560 ;                 TALK ROUTINE
00570 ;
00580 ;
00590 TALK      LD      HL,8000H                ;START OF TALK DATA
00600           LD      BC,6000H                ;NUMBER OF BYTES
00610 LOOP      LD      A,(HL)                  ;GET BYTE
00620           OUT     (255),A                 ;SEND IT TO SPEAKER
00630           PUSH    HL                      ;SAVE POINTER
00640           PUSH    BC                      ;SAVE COUNTER
00650           CALL    DELAY                   ;WAIT A BIT
00660           POP     BC                      ;RESTORE COUNTER
00670           POP     HL                      ;RESTORE POINTER
00680           DEC     BC                      ;DECREMENT COUNTER
00690           INC     HL                      ;INCREMENT POINTER
00700           LD      A,B                     ;IS THE COUNTER TO ZERO
00710           OR      C
00720           JR      NZ,LOOP                 ;LOOP IF NOT
01360 DUMP      LD      HL,FILE                 ;HL POINTS TO FILESPEC
01370                                           ;BUFFER
01380           LD      DE,FILE+1               ;FILESPEC BUFFER + 1
01390           LD      BC,7                    ;NUMBER OF BYTES
01400           LD      (HL),32                 ;CLEAR ONE BYTE
01410           LDIR                            ;LOOP UNTIL DONE
01420           LD      HL,15360+256            ;CURSOR POSITION
01430           LD      (4020H),HL              ;SAVE IT
01440           LD      HL,FILE1                ;'FILENAME?' MESSAGE
01450           CALL    021BH                   ;PUT IT ON SCREEN
01460           LD      B,8                     ;LENGTH
01470           LD      HL,FILE                 ;WHERE TO PUT IT
01480           CALL    40H                     ;GET FILESPEC
01490           LD      HL,FILE                 ;HL -> FILESPEC
01500 FILELP    LD      A,(HL)                  ;GET A CHAR
01510           CP      13                      ;TERMINATOR?
01520           INC     HL                      ;NEXT CHARACTER
01530           JR      NZ,FILELP               ;JUMP IF NOT
01540           DEC     HL                      ;ADJUST HL
01550           LD      (HL),32                 ;TURN IT TO A SPACE
01560           LD      HL,DUMP1                ;'DUMP' COMMAND
01570           CALL    429CH                   ;EXECUTE TRSDOS COMMAND
01580                                           ;AND RETURN TO CALLER
01590           LD      HL,MSG5                 ;'ANOTHER' QUESTION
01600           CALL    021BH                   ;PUT IT ON SCREEN
01610 INPU      LD      B,1                     ;NUMBER OF CHARACTERS
01620           LD      HL,BUFF                 ;WHERE TO PUT IT
01630           CALL    40H                     ;GET CHARACTERS
01640           LD      HL,BUFF                 ;POINT TO CHARACTERS
01650           LD      A,(HL)                  ;GET CHARACTER
01660           CP      'Y'                     ;IS IT A 'Y'?
01670           JP      Z,START                 ;DO IT AGAIN IF SO
01680           CP      'N'                     ;IS IT A 'N'?
01690           JR      NZ,INPU                 ;GET ANOTHER IF NOT
01700           RET                             ;EXIT
01710           END     START                   ;END
```

Listing 2. Program allows you to use speak modules in Basic programs.

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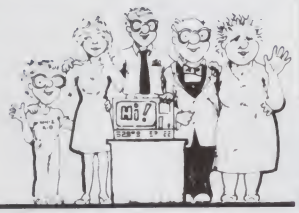
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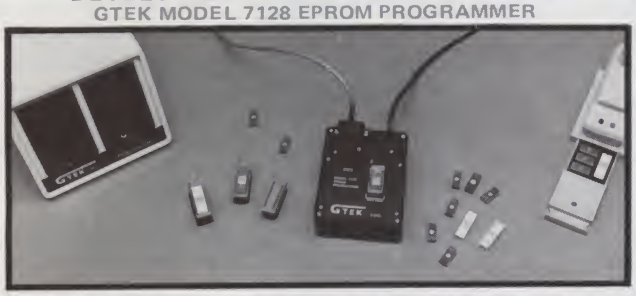
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2764	68766		12816A	8742
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All Sorts of Versatility

The author wrote this Z-80 assembly language sorting routine for Basic users who want fast and flexible reorganization.

By Gregory C. Hamilton

This article provides a versatile Z-80 assembly language sorting routine that is designed specifically for Basic users. Based on the Shell-Metzner sort algorithm that appeared in an article by Albert J. Marino (*Microcomputing*, April 1981), this routine includes these additional features:

1. Sorting of records containing multiple data items
2. User specifications of data items for sort
3. User selectability of sort ordering
4. Partial sort capabilities
5. Tie-breaking logic

Basic, as a language, provides most of us with the programming capabilities we want. There are, however, several perfunctory operations for which Basic requires a lot of time to perform. Sorting data items is one such function.

Fast and Flexible

A sorting routine should be fast, efficient and flexible. This can be achieved by implementing it as an assembly language utility routine to be accessed by Basic through either a Call or USR statement.

I developed the present routine to assist in report preparation and the generation of lists used for academic advising and counseling.

Depending upon the purpose, I often prepared two separate lists of the same data, but organized them differently. For example, two lists containing the names of freshman students and their grade-point averages can be ordered alphabetically or according to descending GPA. Three-level sorts, such as alphabetical lists of student names grouped according to level (freshmen, sophomores and so on) further subdivided into major field of study, are also commonplace.

What emerged was the need for a general-purpose sorting routine that could handle a wide variety of applications. The Z-80 assembly language program shown in Listing 1 does the trick.

Before discussing the routine itself, a few observations about Basic are prerequisite.

Data Manipulation in Basic

I use Microsoft's MBasic disk version 5.03 for general programming purposes. Since my particular application involves student information, my data records consist of several data items for each student (e.g., name, student number and major).

A Basic driving program stores each data item separately in a two-dimensional array, the organization of which is crucial to the sorting routine. MBasic stores two-dimensional arrays columnwise in memory. So data items for the nth record are labeled as A$(1,N), A$(2,N), A$(3,N) and so on with the row index indicating the data item and the column index representing the record index. For the present application, I force all data items to be string variables.

What MBasic actually does is to create a variable pointer array (VARPTR array) consisting of a three-byte code for each data item. The first byte is the length of the data item string (which explains the 255-byte limit on string variables).

The other two bytes are an address (in reverse order) pointing to the location of the actual data item.

Using the Basic VARPTR function with a string variable as the argument will return the address in the VARPTR array of the requested string variable, not the actual address of the string itself. For example, consider the following nine bytes from a VARPTR array located at hex address 6D00.

```
6D00: 1E 00 8D 07 F9 8C 03 F6 8C
```

The first three bytes indicate a string 30 bytes (1E) in length located at hex address 8D00. The next three bytes point to a seven-byte string at hex address 8CF9, while the third string is three bytes long and is found at hex address 8CF6. Notice that the hex addresses decrease in value owing to the fact that string space is allocated dynamically from high memory down. These nine bytes could correspond to A$(1,1), A$(2,1) and A$(3,1) (i.e., pointers to the first three data items of the first record).

The VARPTR array address for any particular data item can be easily determined if you know the starting memory address of the VARPTR array and the total number of data items per record. I will include the mathematical equation since the sorting routine uses it as part of its calculations. The VARPTR array address for data item A$(R,C) is:

Address correspondence to Gregory C. Hamilton, 2219 Sunnyside Ave., Lansing, MI 48910.

START + 3 * ((R - 1) + (C - 1)*MAXROW)

START is the starting memory address of the VARPTR array and MAXROW is the number of data items per record.

The Basic VARPTR(A$(R,C)) function returns the value of the above equation, so Start can be found by using START = VARPTR(A$(1,1)).

The equation holds only if you use an Option Base 1 statement to set the lowest array index to one. This saves three bytes per record in the VARPTR array with minimal inconvenience in computation.

Using the VARPTR array structure and the equation above, the sorting routine can compute the VARPTR array address for any data item and get the memory location of the actual data.

The VARPTR array is also used in the actual sorting of the data items. In the course of the sort, if data items have to be switched, I switch the VARPTR array data rather than the actual data.

Note that all data items that compose a record must be switched, requiring 3*MAXROW byte transfers, which is usually considerably less than switching the actual data. In the example above, I would switch only nine bytes instead of the 40 bytes of actual data (30 + 7 + 3).

Routine Initialization

I have written the routine for access by using the USR statement. The routine requires 286 bytes of memory, including 22 bytes for control parameters and scratch space. Although the listing has its origin at hex address 9C00, it can be assembled elsewhere. The routine requires eight parameters, which may be set by the Basic calling routine. These parameters and their mnemonics are:

1. Beginning record for sorting (MINCOL)
2. Ending record for sorting (MAXCOL)
3. Starting address of VARPTR array (START)
4. Number of data items per record (MAXROW)
5. Data item for primary sort (SRTKEY)
6. Primary sort ordering index (SRTROD)
7. Alternate data item for tie breaking (ALTKEY)
8. Secondary ordering index (ALTORD)

The first two parameters allow for

Listing 1. Z-80 Assembly Language Shell-Metzner Sort.

```
                        0001                ORG     9C00H
                        0002 ;
                        0003 ;
                        0004 ;      SHELL-METZNER SORT:  Z-80 ASSEMBLY VERSION
                        0005 ;
                        0006 ;           ENTRY PARAMETERS:  MINCOL=FIRST COLUMN
                        0007 ;                              MAXCOL=LAST COLUMN
                        0008 ;                              MAXROW=# OF ITEMS/COLUMN
                        0009 ;                              SRTKEY=ROW TO SORT
                        0010 ;                              SRTORD=ORDER FOR SORT
                        0011 ;                              ALTKEY=ALTERNATE SORT ROW
                        0012 ;                              ALTORD=SECONDARY ORDER
                        0013 ;                              START=BASIC ARRAY ADDRESS
                        0014 ;
                        0015 ;           EXIT PARAMETERS:   ADJUSTED VARPTR ARRAY
                        0016 ;
                        0017 ;
                        0018 ;      CALCULATE # OF COLUMNS TO SORT AND SET TO MVAL
                        0019 ;
'9C00  AF               0020                XOR     A               ;CLEAR CARRY
'9C01  2A159D'          0021                LD      HL,(MAXCOL)     ;LAST COLUMN
'9C04  ED5B139          0022                LD      DE,(MINCOL)     ;FIRST COLUMN
'9C08  ED52             0023                SBC     HL,DE
'9C0A  23               0024                INC     HL              ;HL=# OF COLUMNS
'9C0B  22109D'          0025                LD      (MVAL),HL
                        0026 ;
                        0027 ;      CALCULATE AND SAVE M/2:   RETURN IF DONE
                        0028 ;
'9C0E  AF               0029           DIVIDE: XOR     A               ;CLEAR FLAGS
'9C0F  2A109D'          0030                LD      HL,(MVAL)
'9C12  CB1C             0031                RR      H               ;DIVIDE BY 2
'9C14  CB1D             0032                RR      L
'9C16  7D               0033                LD      A,L
'9C17  B4               0034                OR      H
'9C18  C8               0035                RET     Z               ;RETURN IF ZERO
'9C19  22109D'          0036                LD      (MVAL),HL
                        0037 ;
                        0038 ;      SET KVAL = UPPER LIMIT - MVAL
                        0039 ;
'9C1C  EB               0040                EX      DE,HL           ;DE=M/2
'9C1D  2A159D'          0041                LD      HL,(MAXCOL)     ;LAST COLUMN
'9C20  AF               0042                XOR     A               ;CLEAR CARRY
'9C21  ED52             0043                SBC     HL,DE
'9C23  220C9D'          0044                LD      (KVAL),HL       ;SAVE AS KVAL
                        0045 ;
                        0046 ;      INITIALIZE IVAL AND JVAL
                        0047 ;
'9C26  2A139D'          0048                LD      HL,(MINCOL)     ;LOWEST TO SORT
'9C29  22089D'          0049                LD      (IVAL),HL
'9C2C  220A9D'          0050                LD      (JVAL),HL
                        0051 ;
                        0052 ;      SET LVAL AND GET BASIC VARPTR ADDRESSES
                        0053 ;
'9C2F  AF               0054          FNDADR: XOR     A               ;CLEAR FLAGS
'9C30  32129D'          0055                LD      (FLAG),A        ;PRIMARY ITEMS
'9C33  3A1B9D'          0056                LD      A,(SRTORD)      ;SET ORDER
'9C36  E5               0057                PUSH    HL              ;SAVE IVAL
'9C37  CDFD9C'          0058                CALL    SETORD
'9C3A  E1               0059                POP     HL              ;RESET IVAL
'9C3B  EB               0060                EX      DE,HL           ;DE=IVAL
'9C3C  19               0061                ADD     HL,DE           ;HL=LVAL
'9C3D  220E9D'          0062                LD      (LVAL),HL
'9C40  3A1A9D'          0063                LD      A,(SRTKEY)      ;GET SORT INDEX
'9C43  CDE19C'          0064          GETPTR: CALL    SRTADR          ;IVAL VARPTR
'9C46  CDE19C'          0065                CALL    SRTADR          ;LVAL VARPTR
'9C49  D5               0066                PUSH    DE              ;SAVE IVAL ADDR
                        0067 ;
                        0068 ;      SET HL AND DE TO ACTUAL DATA ADDRESSES
                        0069 ;
'9C4A  7E               0070                LD      A,(HL)          ;STRING LENGTH
'9C4B  23               0071                INC     HL
'9C4C  5E               0072                LD      E,(HL)          ;LOW BYTE
'9C4D  23               0073                INC     HL
'9C4E  56               0074                LD      D,(HL)          ;DE=LVAL DATA
'9C4F  E1               0075                POP     HL              ;IVAL VARPTR
'9C50  23               0076                INC     HL              ;SKIP LENGTH
'9C51  4E               0077                LD      C,(HL)          ;LOW BYTE
'9C52  23               0078                INC     HL
'9C53  46               0079                LD      B,(HL)          ;BC=IVAL DATA
'9C54  60               0080                LD      H,B             ;MOVE TO HL
'9C55  69               0081                LD      L,C
'9C56  47               0082                LD      B,A             ;B=STRING LENGTH
                        0083 ;
                        0084 ;      COMPARE ASCII STRINGS
                        0085 ;
'9C57  1A               0086          COMPAR: LD      A,(DE)          ;LVAL DATA
'9C58  96               0087                SUB     (HL)            ;IVAL DATA
'9C59  C26B9C'          0088                JP      NZ,DECIDE
'9C5C  13               0089                INC     DE
```

More

Listing continued.

```
'9C5D  23        0090                INC     HL
'9C5E  10F7      0091                DJNZ    COMPAR-$        ;CHECK ALL BYTES
               0092 ;
               0093 ;    ITEMS EQUAL-CHECK IF ALTERNATE ITEM WAS USED
               0094 ;
'9C60  3A129D'   0095                LD      A,(FLAG)
'9C63  FE01      0096                CP      1               ;DO ALT COMPARE?
'9C65  CAB19C'   0097                JP      Z,BUMPJ
'9C68  C3C99C'   0098                JP      EQUAL           ;ITEMS ARE SAME
               0099 ;
'9C6B  DAB19C'   0100       DECIDE:  JP      C,BUMPJ         ;DO WE SWITCH?
               0101 ;
               0102 ;    EXCHANGE IVAL AND LVAL VARPTRS
               0103 ;    GET VARPTR ADDRESS OF FIRST DATA ITEM
               0104 ;
'9C6E  ED5B089D' 0105        EXCNG:  LD      DE,(IVAL)       ;IVAL INDEX
'9C72  2A0E9D'   0106                LD      HL,(LVAL)       ;LVAL INDEX
'9C75  3E01      0107                LD      A,1             ;ALL ITEMS
'9C77  CDE19C'   0108                CALL    SRTADR          ;IVAL VARPTR
'9C7A  CDE19C'   0109                CALL    SRTADR          ;LVAL VARPTR
'9C7D  3A199D'   0110                LD      A,(MAXROW)
'9C80  47        0111                LD      B,A             ;DO ALL ITEMS
'9C81  C5        0112       ITEMSW:  PUSH    BC              ;SAVE ITEM COUNT
'9C82  0603      0113                LD      B,3             ;SWAP 3 BYTES
'9C84  4E        0114       VARPTR:  LD      C,(HL)
'9C85  1A        0115                LD      A,(DE)          ;SWITCH VARPTRS
'9C86  77        0116                LD      (HL),A
'9C87  79        0117                LD      A,C
'9C88  12        0118                LD      (DE),A
'9C89  23        0119                INC     HL
'9C8A  13        0120                INC     DE
'9C8B  10F7      0121                DJNZ    VARPTR-$        ;ALL 3 BYTES
'9C8D  C1        0122                POP     BC              ;RESET COUNTER
'9C8E  10F1      0123                DJNZ    ITEMSW-$        ;DO ALL ITEMS
               0124 ;
               0125 ;    RESET IVAL AND CHECK IF DONE
               0126 ;
'9C90  AF        0127                XOR     A
'9C91  ED5B109D' 0128                LD      DE,(MVAL)
'9C95  2A089D'   0129                LD      HL,(IVAL)
'9C98  ED52      0130                SBC     HL,DE
'9C9A  22089D'   0131                LD      (IVAL),HL       ;NEW IVAL
'9C9D  AF        0132                XOR     A               ;CLEAR FOR CHECK
'9C9E  ED5B139D' 0133                LD      DE,(MINCOL)
'9CA2  ED52      0134                SBC     HL,DE
'9CA4  FAB19C'   0135                JP      M,BUMPJ
               0136 ;
               0137 ;    SET UP FOR NEXT COMPARISON
               0138 ;
'9CA7  ED5B109D' 0139       NXTCOL:  LD      DE,(MVAL)
'9CAB  2A089D'   0140                LD      HL,(IVAL)       ;DO NEXT COLUMN
'9CAE  C32F9C'   0141                JP      FNDADR
               0142 ;
               0143 ;    INCREMENT JVAL AND COMPARE WITH KVAL
               0144 ;
'9CB1  2A0A9D'   0145       BUMPJ:   LD      HL,(JVAL)       ;BUMP JVAL
'9CB4  23        0146                INC     HL
'9CB5  220A9D'   0147                LD      (JVAL),HL
'9CB8  22089D'   0148                LD      (IVAL),HL       ;AND IVAL
'9CBB  ED5B0C9D' 0149                LD      DE,(KVAL)       ;JVAL > KVAL?
'9CBF  EB        0150                EX      DE,HL           ;SWAP FOR SUB
'9CC0  AF        0151                XOR     A
'9CC1  ED52      0152                SBC     HL,DE
'9CC3  DA0E9C'   0153                JP      C,DIVIDE
'9CC6  C3A79C'   0154                JP      NXTCOL          ;DO NEXT COLUMN
               0155 ;
               0156 ;    SORT ON ALTERNATE ITEM IF PRIMARIES EQUAL
               0157 ;
'9CC9  3E01      0158       EQUAL:   LD      A,1             ;SET FLAG TO
'9CCB  32129D'   0159                LD      (FLAG),A        ;STOP LOOP
'9CCE  3A1D9D'   0160                LD      A,(ALTORD)      ;SET ALT ORDER
'9CD1  CDFD9C'   0161                CALL    SETORD
'9CD4  2A0E9D'   0162                LD      HL,(LVAL)
'9CD7  ED5B089D' 0163                LD      DE,(IVAL)
'9CDB  3A1C9D'   0164                LD      A,(ALTKEY)      ;OTHER SORT KEY
'9CDE  C3439C'   0165                JP      GETPTR
               0166 ;
               0167 ;    SUBROUTINE SRTADR - GENERATES VARPTR ADDRESS
               0168 :
               0169 ;         ENTRY PARAMETERS:  A = ROW TO SORT
               0170 ;                            DE = COLUMN INDEX TO BE
               0171 ;                                 USED IN COMPARISON
               0172 ;         EXIT PARAMETERS:   HL = VARPTR ADDRESS
               0173 ;                            DE = ENTRY VALUE OF HL
               0174 ;                            A = UNCHANGED
               0175 ;
'9CE1  08        0176       SRTADR:  EX      AF,AF'          ;SAVE A REG
'9CE2  E5        0177                PUSH    HL
'9CE3  210000    0178                LD      HL,0            ;SUM = 0
```

More

either complete or partial sorting of the data. Only those records starting with MINCOL and ending with MAXCOL will be sorted. The entire data file can be sorted using values of one (default) and the maximum number of records. Partial sort capabilities are, therefore, possible by appropriate definitions of these two parameters.

The sort itself is based on a comparison of data items. You can specify the data item (row index) to use for the primary comparison. A secondary index can be set for use in deciding the order in the case of a tie between primary data items. Both of these values, SRTKEY and ALTKEY, have default values of one.

You also have the option of having a sort done by ranking the data items from lowest ASCII value to highest or vice versa. The two parameters SRTORD and ALTORD specify the order for comparison of primary and secondary data items, respectively. The order is defaulted to be from low to high if these parameters aren't set.

The ALTORD parameter gives you complete control over the order of data records that have equal primary data items.

For calculation purposes, the routine also needs the beginning address of the VARPTR array (Start) and the maximum number of data items per record (MAXROW).

The values of these eight parameters are loaded into memory using the Poke statement. I prefer to group data variables at the end of my routines, so the parameter values are located from ORG+275 to ORG+285.

The values of MINCOL, MAXCOL and Start are two-byte values and must be entered in standard Z-80 reverse order. The remaining five values require only one byte and start at ORG+281. The parameters appear in the routine in the same order as they are listed above.

A Modified S+M Routine

Once the data items have been defined and the entry parameters specified, the sorting routine is accessed by the USR statement. The routine itself is based on the modified version of the Shell-Metzner sort algorithm depicted in Fig. 1. I've included substantial documentation in the listing but a few points should be made.

The statement labeled Decide determines whether to switch the two items being compared. Changing the condition from carry (C) to no-carry (NC) will cause the routine to perform

the high- to low-rank ordering.

There is a short subroutine called SETORD that sets the byte at hex address 9C6B to D2 for a low-to-high ordering or DA for the reverse ordering. The routine, therefore, actually modifies itself by setting this single byte depending on the value of SRTORD and ALTORD.

I have also written a subroutine called SRTADR; it calculates the VARPTR address of the data item that is being used in the comparison. This routine is called with the DE register pair that contains the IVAL and the HL registers with LVAL. Upon returning, the HL registers contain the VARPTR address of IVAL and DE registers have LVAL. Calling the subroutine a second time will return the VARPTR address of IVAL in the DE registers and the VARPTR address of LVAL in the HL registers.

Once these VARPTR addresses are calculated, I use them to reset the DE and HL register pairs to the addresses of the actual data to be compared. Note that I also set the B register to the length of the ASCII string.

In the event that the characters in the first string are identical to those in the second, the routine must decide if it has just compared the primary data items or the secondary ones. This is the function of the Flag variable. Flag is set to zero whenever the primary data items are being compared. If the primary data items are equal, then the routine jumps to Equal where Flag is set to one, indicating that the secondary data items are being compared. By checking this variable, I avoid an infinite loop problem. Equal also calls the SETORD subroutine to set the Decide byte.

If the data items aren't in the desired order, all of the data items that make up the record must be exchanged. The EXCNG section, therefore, calculates the VARPTR address of the first data items and sets up a DJNZ loop on all MAXROW items. Note that the first data item is not necessarily the primary or secondary item used for comparison. Also notice that I switch the three VARPTR bytes for each data item and not the actual data, thus compensating for some of the time spent in the calculations.

Listing continued.

```
'9CE6  1B          0179                DEC     DE              ;COLUMN-1
'9CE7  3A199D'     0180                LD      A,(MAXROW)
'9CEA  47          0181                LD      B,A             ;SET UP LOOP
'9CEB  19          0182                ADD     HL,DE
'9CEC  10FD        0183                DJNZ    -1              ;HL=(C-1)*MAXROW
'9CEE  08          0184                EX      AF,AF'          ;GET SORT ROW
'9CEF  4F          0185                LD      C,A
'9CF0  0D          0186                DEC     C               ;(ROW-1)
'9CF1  09          0187                ADD     HL,BC           ;ADD IT IN
'9CF2  E5          0188                PUSH    HL              ;MOVE TO DE
'9CF3  D1          0189                POP     DE
'9CF4  19          0190                ADD     HL,DE           ;TIMES 2
'9CF5  19          0191                ADD     HL,DE           ;TIMES 3
'9CF6  ED5B179D'   0192                LD      DE,(START)      ;ARRAY BIAS
'9CFA  19          0193                ADD     HL,DE
'9CFB  D1          0194                POP     DE              ;DE = ENTRY HL
'9CFC  C9          0195                RET
                   0196 ;
                   0197 ;    SUBROUTINE SETORD - SETS ORDERING KEY
                   0198 ;
                   0199 ;         ENTRY PARAMETER:  A = ORDERING KEY
                   0200 ;
'9CFD  216B9C'     0201          SETORD: LD      HL,DECIDE
'9D00  36D2        0202                  LD      (HL),0D2H       ;LOW TO HIGH
'9D02  FE00        0203                  CP      0               ;A REG = ZERO
'9D04  C8          0204                  RET     Z
'9D05  36DA        0205                  LD      (HL),0DAH       ;HIGH TO LOW
'9D07  C9          0206                  RET
                   0207 ;
                   0208 ;    DATA BLOCK AND SCRATCH PAD
                   0209 ;
'9D08  0000        0210             IVAL:  DB      0,0
'9D0A  0000        0211             JVAL:  DB      0,0
'9D0C  0000        0212             KVAL:  DB      0,0
'9D0E  0000        0213             LVAL:  DB      0,0
'9D10  0000        0214             MVAL:  DB      0,0
'9D12  00          0215             FLAG:  DB      0
'9D13  0100        0216           MINCOL:  DB      1,0
'9D15  0100        0217           MAXCOL:  DB      1,0
'9D17  0000        0218            START:  DB      0,0
'9D19  01          0219           MAXROW:  DB      1
'9D1A  01          0220           SRTKEY:  DB      1
'9D1B  00          0221           SRTORD:  DB      0
'9D1C  01          0222           ALTKEY:  DB      1
'9D1D  00          0223           ALTORD:  DB      0
```

Performing Monumental Tasks

The routine is capable of sorting data items 255 characters in length. It can handle 65,535 records, each containing 255 data items. However, most of us don't perform such monumental tasks on a microcomputer. My work has involved sorting 150 records, each with data items having a composite length of 80 characters. This routine can accomplish even the most complex sort in one to two seconds. Although far from a benchmark value, it does indicate that the speed is acceptable.

Most versions of Basic that support the VARPTR function also recognize

```
5000 PRINT "Command Options: Sort, Display, Print or End ";
5010 INPUT "(S,D,P,E)";C$ : PRINT
5020 IF C$="S" THEN GOSUB 5060
5030 IF C$="D" THEN PRINT CHR$(12) : PRINT : GOSUB (DISPLAY ROUTINE)
5040 IF C$="P" THEN GOSUB (PRINT ROUTINE)
5050 IF C$<>"E" THEN 5000 ELSE END
5060 PRINT : INPUT "Beginning index for sort";I : PRINT
5070 POKE &H9D13,(I MOD 256) : POKE &H9D14,(I\256)
5080 INPUT "Ending index for sort";I : IF I>=999 THEN I=NSTU
5090 PRINT : POKE &H9D15,(I MOD 256) : POKE &H9D16,(I\256)
5100 X=VARPTR(SD$(1,1)) MOD 256 : POKE &H9D17,X
5110 X=VARPTR(SD$(1,1))\256 : POKE &H9D18,X : POKE &H9D19,ITEM
5120 INPUT "Primary data item index for sort";I : POKE &H9D1A,I
5130 PRINT : INPUT "High to low order (Y/N)";B$
5140 PRINT : POKE &H9D1B,0 : IF B$="Y" THEN POKE &H9D1B,1
5150 INPUT "Alternate data item index for sort";I : PRINT
5160 INPUT "High to low order (Y/N)";B$ : POKE &H9DIC,I
5170 PRINT : POKE &H9D1D,0 : IF B$="Y" THEN POKE &H9D1D,1
5180 X=USR(&H9C00) : RETURN
```

Listing 2. Basic dialogue routine.

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integer divide (\) and MOD. The parameters that require two bytes can most efficiently be set by using:

HBYTE = X\256 and LBYTE = X MOD 256

X is the value of the parameter.

You should set a maximum limit on the memory available for Basic by using the M: specification upon initialization. This will prevent Basic from overwriting your assembly language routine.

Finally, it is advantageous to write a dialogue routine in Basic to establish the parameter values for the sort. Using such a routine will prevent both continual changes to the Basic code and possible errors in parameter specification. Your dialogue routine, however, will depend on your particular application. Listing 2 contains the Basic subroutine that I find most effective.

The SD$ array holds the student data that is to be sorted; NSTU is the maximum number of students in the data pool (data records); and Item is the number of data items per record. Each of these variables is defined in the main driving routine.

This sorting routine has served me well over the last few years. If your work requires sorting and/or reorganizing multiple data items per record, give this routine a try. I think you'll be pleased with the results.■

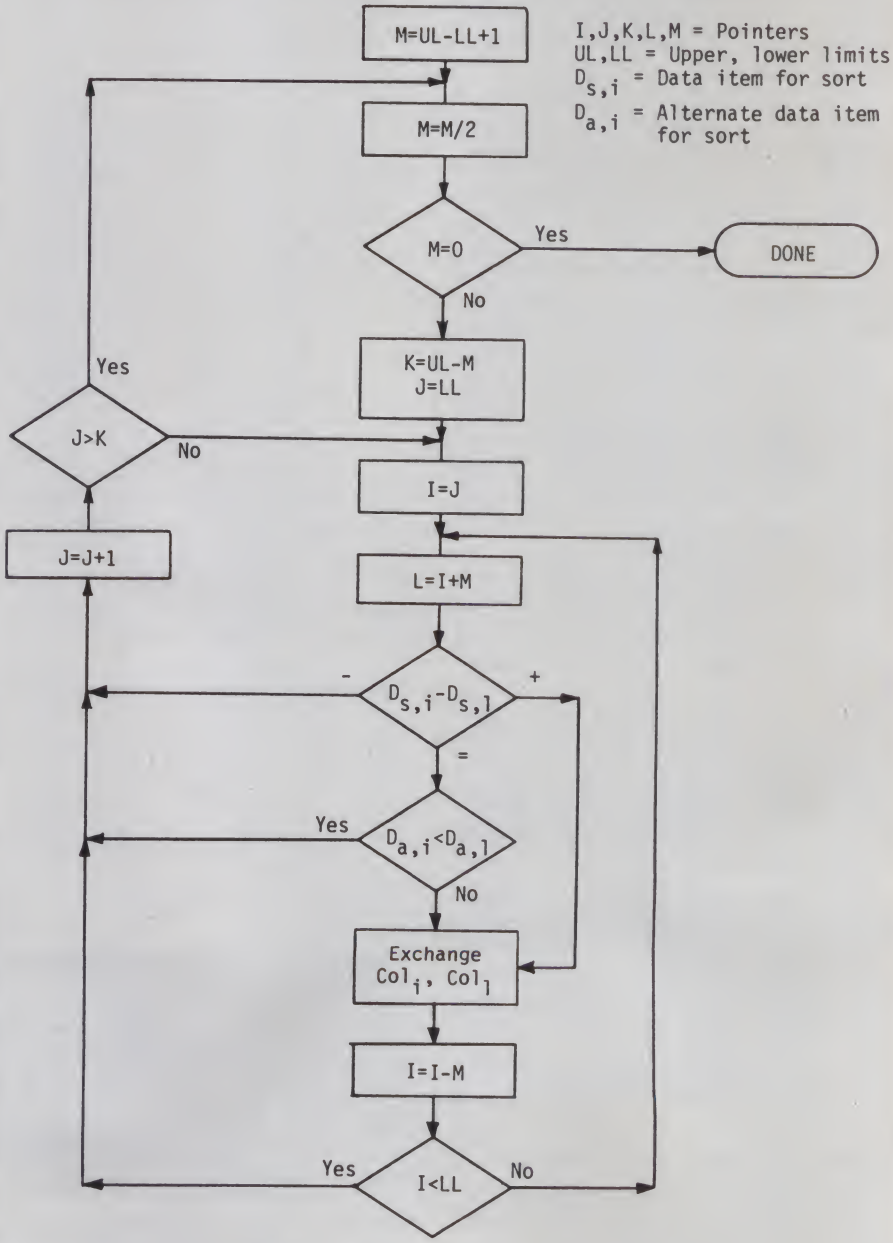


Fig. 1. Modified Shell-Metzner sort flowchart.

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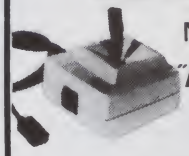
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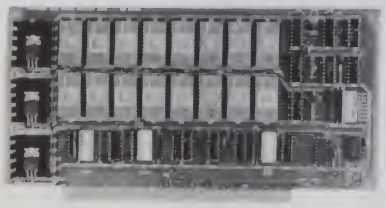
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4. Addressable as two independent 16K blocks
5. Cromemco extended or Northstar bank select
6. On board wait state circuitry if needed
7. Any or all EPROM locations can be disabled
8. Double sided PC board, solder-masked, silk-screened
9. Gold plated contact fingers
10. Unselected EPROM's automatically powered down for low power
11. Fully bufferred and bypassed
12. Easy and quick to assemble

64K S100 STATIC RAM

$199.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $185

ASSEMBLED AND TESTED ADD $50

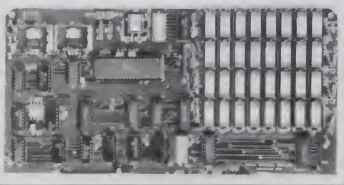


FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports IEEE 696 24 BIT Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- 2716 EPROMs may be installed in any of top 48K.
- Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- BOARD may be partially populated as 56K.

256K S-100 SOLID STATE DISK SIMULATOR!

WE CALL THIS BOARD THE "LIGHT-SPEED-100" BECAUSE IT OFFERS AN ASTOUNDING INCREASE IN YOUR COMPUTER'S PERFORMANCE WHEN COMPARED TO A MECHANICAL FLOPPY DISK DRIVE.



FEATURES:

- 256K on board, using + 5V 64K DRAMS.
- Uses new Intel 8203-1 LSI Memory Controller.
- Requires only 4 Dip Switch Selectable I/O Ports.
- Runs on 8080 or Z80 S100 machines.
- Up to 8 LS-100 boards can be run together for 2 Meg. of On Line Solid State Disk Storage.
- Provisions for Battery back-up.
- Software to mate the LS-100 to your CP/M* 2.2 DOS is supplied.
- The LS-100 provides an increase in speed of up to 7 to 10 times on Disk Intensive Software.
- Compare our price! You could pay up to 3 times as much for similar boards.

ADD $50 FOR A & T KIT.

BLANK PCB (WITH CP/M* 2.2 PATCHES ON DISK) $69.95

$399.00

#LS-100 (FULL 256K KIT)

64K SS-50 STATIC RAM

$179.00 (48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

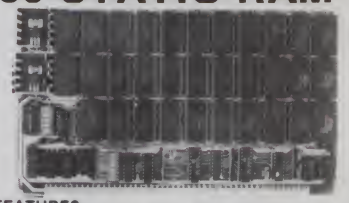
SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $219

64K Kit $249

ASSEMBLED AND TESTED ADD $50



FEATURES:

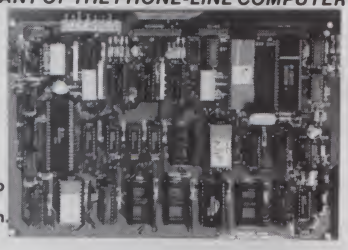
- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- 2716 EPROMs may be installed anywhere on Board.
- Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- One Board supports both RAM and EPROM.
- RAM supports 2MHZ operation at no extra charge!
- Board may be partially populated in 16K increments.

THE NEW ZRT-80 CRT TERMINAL BOARD!

A LOW COST Z-80 BASED SINGLE BOARD THAT ONLY NEEDS AN ASCII KEYBOARD, POWER SUPPLY, AND VIDEO MONITOR TO MAKE A COMPLETE CRT TERMINAL. USE AS A COMPUTER CONSOLE, OR WITH A MODEM FOR USE WITH ANY OF THE PHONE-LINE COMPUTER SERVICES.

FEATURES:

- Uses a Z80A and 6845 CRT Controller for powerful video capabilities.
- RS232 at 16 BAUD Rates from 75 to 19,200.
- 24 x 80 standard format (60 Hz).
- Optional formats from 24 x 80 (50 Hz) to 64 lines x 96 characters (60 Hz).
- Higher density formats require up to 3 additional 2K x 8 6116 RAMS.
- Uses N.S. INS 8250 BAUD Rate Gen. and USART combo IC.
- 3 Terminal Emulation Modes which are Dip Switch selectable. These include the LSI-ADM3A, the Heath H-19, and the Beehive.
- Composite or Split Video.
- Any polarity of video or sync.
- Inverse Video Capability.
- Small Size: 6.5 x 9 inches.



BLANK PCB WITH 2716 CHAR. ROM, 2732 MON. ROM $59.95

SOURCE DISKETTE - ADD $10

SET OF 2 CRYSTALS - ADD $7.50

ADD $50 FOR A & T KIT.

ZRT-80

WITH 8 IN. SOURCE DISK! **$129.95** (COMPLETE KIT, 2K VIDEO RAM)

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! **NEW!**

EPROM II FULL EPROM KIT $80.00

A&T EPROM ADD $35.00



BLANK PC BOARD WITH DATA $39.95

SUPPORT IC'S PLUS CAPS $23.00

FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:

- This one board can be used in any one of four ways:
 - A. As a 32K 2716 EPROM Board
 - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
 - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
 - D. As a 32K Static RAM Board
- Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- Fully Supports IEEE 696 Buss Standard (As Proposed)
- Supports 24 Bit Extended Adressing
- 200 NS (FAST!) RAM'S are standard on the RAM Kit
- Supports both Cromemco and North Star Bank Select
- Supports Phantom
- On Board wait State Generator
- Every 2K Block may be disabled
- Addressed as two separate 16K Blocks on any 64K Boundary
- Perfect for MP/M* Systems
- RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $129.95

For RAM Kit A&T - Add $40

Digital Research Computers

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TERMS: Add $3.00 postage. We pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

*TM OF DIGITAL RESEARCH INC. (CALIF.)

WE ARE NOT ASSOCIATED WITH DIGITAL RESEARCH INC. (CALIF.) THE SUPPLIERS OF CPM SOFTWARE

FEATURES THE POWERFUL, THIRD GENERATION, MOTOROLA 6809 PROCESSOR!

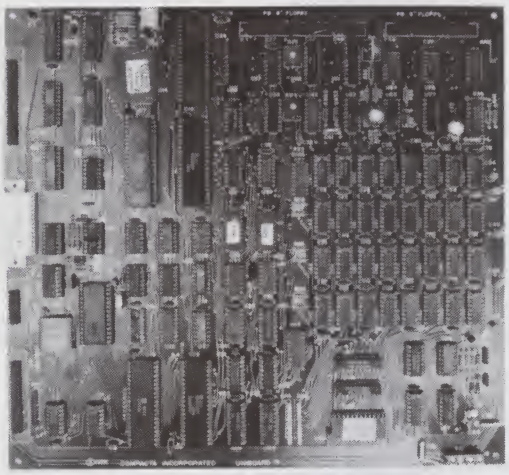
THE 6809 "UNIBOARD"™

SINGLE BOARD COMPUTER KIT

New!

PERFECT FOR COLLEGES, OEM'S, INDUSTRIAL AND SCIENTIFIC USES!

64K RAM! DOUBLE DENSITY FLOPPY DISK CONTROLLER!



BLANK PC BOARD
$99.95
WITH PAL'S, AND TWO EPROMS.

FOR 5-1/4 OR 8 INCH SOURCE DISKETTE ADD $10.

$399.00
COMPLETE KIT! FULLY SOCKETED.

ALL OPTIONS ARE STANDARD. NO EXTRAS TO BUY!

THE COMPACTA UNIBOARD™: Through special arrangement with COMPACTA INC., we are proud to have been selected the exclusive U.S. Mfg. of their new 6809 UNIBOARD™ COMPUTER KIT. Many software professionals feel that the 6809 features probably the most powerful instruction set available today on ANY 8 bit micro. Now, at last, all of that immense computing power is available at a truly unbelievably low price.

FEATURES:

- ★ 64K RAM using 4116 RAMS.
- ★ 6809E Motorola CPU.
- ★ Double Density Floppy Disk Controller for either 5-1/4 or 8 inch drives. Uses WD1793.
- ★ On board 80 x 24 video for a low cost console. Uses 2716 Char. Gen. Programmable Formats. Uses 6845 CRT Controller.
- ★ ASCII keyboard parallel input interface. (6522)
- ★ Serial I/O (6551) for RS232C or 20 MA loop.
- ★ Centronics compatible parallel printer interface. (6522)
- ★ Buss expansion interface with DMA channel. (6844)
- ★ Dual timer for real time clock application.
- ★ Powerful on board system monitor (2732). Features commands such as Go To, Alter, Fill, Move, Display, or Test Memory. Also Read and Write Sectors. Boot Normal, Unknown, and General Flex™.

YOUR CHOICE OF POPULAR DISK OPERATING SYSTEMS:

FLEX™ from TSC	$149
OS9™ from Microware	$199

Specify 5-1/4 or 8 Inch

PC BOARD IS DOUBLE SIDED, PLATED THRU SOLDER MASKED, 11 x 11-1/2 IN.

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A FREE COPY IS AVAILABLE UPON REQUEST.

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(OF TEXAS)
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TERMS: Shipments will be made approximately 3 to 6 weeks after we receive your order. VISA, MC, cash accepted. Add $4.00 shipping.
USA AND CANADA ONLY

VOICE SYNTHESIZER FOR APPLE AND COMMODORE



JE520CM

• Over 250 word vocabulary - affixes allow the formation of more than 500 words • Built-in amplifier, speaker, volume control, and audio jack • Recreates a clear, natural male voice • Plug-in user ready with documentation and sample software • Case size: 7¼"L x 3¼"W x 1-3/8"H

APPLICATIONS:

- Security Werning
- Teaching
- Instrumentation
- Telecommunication
- Handicap Aid
- Games

The JE520 VOICE SYNTHESIZER will plug right into your computer and allow you to enhance almost any application. Utilizing National Samiconductor's DIGITALKER™ Speech Processor IC (with four custom memory chips), the JE520 compresses natural speech into digital memory, including the original inflections and emphases. The result is an extremely clear, natural vocalization.

Part No.	Description	Price
JE520CM	For Commodore 64 & VIC-20	$114.95
JE520AP	For Apple II, II+, and *IIe*	$149.95

Micro-Logic Corp. MICRO-CHARTS



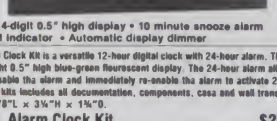
• Fully decoded data • Instant access • 2-sided, totally comprehensive • Compact 8½ x 11 in. durable credit card plastic • Perfect for programmers & engineers • Clear & concise tables for: full instruction set, disassembly, ASCII, base conversion, effect of flags, compare vs. jump, interrupt structure, pinout, cycle times, diagrams, bug notes, & much more

PART NO.	REFERENCE	PRICE
ML-Z80	Z80 CPU	$5.95
ML-8080A	8080A/8085A	$5.95
ML-6502	6502 (65XX)	$5.95
ML-8048	8048, Relatives	$5.95
ML-7400	5400/7400 TTL Pin-Outs	$5.95
ML-ALGO	Basic Algorithms	$5.95

BOOKS

30001	National CMOS Data Book (1981) (640 pages) 74C, CD4000, and A/D Converters	$6.95
30003	National Linear Data Book (1982) (1376 pages) LM, LF, ADC, DAC, LH Series	$11.95
30008	National Memory Data Book (1980) (464 pages) RAMs, ROMs, PROMs, EPROMs Series	$6.95
30009	Intersil Data Book (1983) (1356 pages) Complete line.	$9.95
30010	National Audio/Radio Handbook (1980) (240 pages) Pre-Amps, AM, FM & FM Stereo, Power Amps	$5.95
30012	National PAL Data Book (1982) (176 pages) Application Notes, Linear Briefs, etc.	$5.95
30013	Zilog Data Book (1983) (641 pages) Microprocessors and Support Chips	$7.95
210830	Intel Memory Components Handbook (1983) (798 pages) Contains all Application Notes, Article Reprints, Data Sheets, and other design information on Intel's RAMs, EPROMs, E²PROMs & Bubble Memories.	$14.95
210844	Intel Microprocessor & Peripheral Handbook (1983) (1027 pages) Contains Data Sheets on all of Intel's Microprocessors and Peripherals.	$14.95

4-Digit Fluorescent Alarm Clock Kit

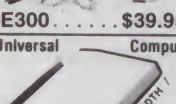


• Bright 4-digit 0.5" high display • 10 minute snooze alarm • AM/PM indicator • Automatic display dimmer

The JE750 Clock Kit is a versatile 12-hour digital clock with 24-hour alarm. The clock has a bright 0.5" high blue-green flourescent display. The 24-hour alarm allows the user to disable the alarm and immediately re-enable the alarm to activate 24 hours later. The kits includes all documentation, components, case and wall transformer. Size: 6-5/8"L x 3¼"H x 1¾"D.

JE750 Alarm Clock Kit $29.95

Jameco ELECTRONICS Digital Thermometer Kit



Dual sensors — switch controls for indoor/outdoor or dual monitoring — can be extended to 500 feet. Continuous LED .8" ht. display. Range: -40°F to 199°F, -40°C to 100°C. Accuracy ±1° nominal. Calibrate for Fahrenheit/Celsius. Simulated walnut case. AC wall adapter included. Size: 6¾"L x 3¼"H x 1¾"D.

JE300 $39.95

Universal Computer Keyboard Enclosures



"DTE" Blank Desk-Top Enclosures are designed for easy modification. High strength epoxy molded end pieces in mocha brown finish. Sliding rear/bottom panel for service/component access. Top/bott. panels .080" thick alum. alodine type 1200 finish (gold tint color) for best paint adhesion after modification. Vented top & bottom panels for cooling efficiency. Rigid construction provides unlimited applications. Assembly instructions included

DTE-8	Panel Width 7.5"	$24.95
DTE-11	Panel Width 10.13"	$27.95
DTE-14	Panel Width 13.5"	$29.95
DTE-20	Panel Width 19.25"	$34.95
DTE-22	Panel Width 21.375"	$39.95



CARD-EDGE CONNECTOR Mates with double-sided 1/10" PC board with contact fingers on .100" centers

CARD-EDGE CONNECTORS

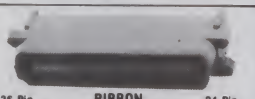
Part No	No. of Contacts/ Conductors	1-9	10-99	100+
C20	20	2.35	2.09	1.89
C26	26	2.99	2.39	2.09
C34	34	3.29	2.95	2.59
C40	40	3.69	3.29	2.89
C50	50	4.39	3.95	3.39



SOLDER TRANSITION CONNECTORS

FOR PERMANENT TERMINATION TO PRINTED CIRCUIT BOARDS

Part No	No. of Contacts	1-9	10-99	100+
ST26	20	1.15	99	99
ST26	26	1.25	1.15	99
ST34	34	1.49	1.35	1.15
ST40	40	1.99	1.55	1.35
ST50	50	1.99	1.89	1.49

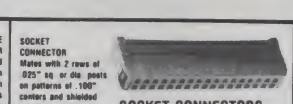


36-Pin CENTRONICS RIBBON CONNECTORS 24-Pin IEEE488

Part No	No. of Contacts/ Style	1-9	10-99	100+
CEN14M	14 Male	5.39	5.49	4.49
CEN14F	14 Female	9.19	5.29	4.29
CEN24M	24 Male	7.95	9.85	5.95
CEN24F	24 Female	7.99	9.79	5.75
CEN36M	36 Male	8.69	7.59	6.49
CEN36F	36 Female	9.75	8.95	7.95

28AWG FLAT GREY CABLE

Part No	No. of Conductors / Connector & Wire Type	Price Per Foot
171-9	9 / 28AWG Flat Stranded	19
171-14	14 / 28AWG Flat Stranded	25
171-15	15 / 29AWG Flat Stranded	27
171-16	16 / 28AWG Flat Stranded	29
171-20	20 / 28AWG Flat Stranded	36
171-24	24 / 28AWG Flat Stranded	45
171-25	25 / 28AWG Flat Stranded	47
171-26	26 / 28AWG Flat Stranded	49
171-34	34 / 28AWG Flat Stranded	62
171-36	36 / 28AWG Flat Stranded	65
171-37	37 / 28AWG Flat Stranded	69
171-40	40 / 28AWG Flat Stranded	75
171-50	50 / 28AWG Flat Stranded	89



SOCKET CONNECTOR Mates with 2 rows of .025" sq. or dia. posts on patterns of .100" centers and shielded receptacles

SOCKET CONNECTORS

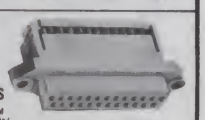
Part No	No. of Contacts/ Conductors	1-9	10-99	100+
S20	26	1.39	1.25	1.09
S26	26	1.69	1.49	1.35
S34	34	2.09	1.79	1.59
S40	40	2.29	2.09	1.79
S50	50	2.69	2.39	2.09
S60	60	3.39	2.95	2.59

MALE CONNECTOR



Mates with Socket Connector .10" x .10"

Part No	No. of Contacts/ Conductors	1-9	10-99	100+
M26	26	4.09	3.85	3.19
M26	26	4.49	3.95	3.49
M34	34	4.95	4.49	3.95
M40	40	5.49	4.89	4.29
M50	50	6.49	5.75	4.95



D-SUB CONNECTORS

Part No	No. of Contacts/ Style	1-9	10-99	100+
CDE9P	9 Male	2.95	2.65	2.29
CDE9S	9 Female	3.39	3.09	2.69
CDA15P	15 Male	3.95	3.55	3.09
CDA15S	15 Female	4.75	4.19	3.99
CDB25P	25 Male	5.49	4.79	4.25
CDB25S	25 Female	5.85	5.49	4.85
CDC37P	37 Male	7.79	6.85	6.09
CDC37S	37 Female	8.95	7.95	6.95

CUSTOM ASSEMBLIES

Use the part numbers from the connectors and cable to order your own custom assembled cables

EXAMPLE: If you desire a 25-foot cable with a male "Centronics" connector on one end, and a female "Centronics" connector on the other end, you would order:

CEN36M-25'-CEN36F CUSTOM

$8.69 (CEN36M) + 9.75 (CEN36F) =	$18.44
85 x 25 (25 feet 36 cond. cable) =	$18.25
2.00 Set-up charge on all custom cables =	$ 2.00
This (CEN36M-25'-CEN36F CUSTOM) Cable would cost:	$38.69

Please specify "CUSTOM" after the part no. to ensure your order will be filled correctly. (Important: Please specify cable in FEET, not inches)

ALL CUSTOM ASSEMBLIES MUST BE PREPAID BEFORE ASSEMBLY. THERE ARE NO RETURNS ON CUSTOM CABLE ASSEMBLIES. $2.00 SET-UP CHARGE (PER STYLE) ON ALL CUSTOM CABLES

ACCESSORIES FOR APPLE* COMPUTERS

Numeric/Auxiliary Keypad for APPLE *IIe**



The JE614 is a newly introduced numeric/auxiliary keypad for the APPLE *IIe*.* It offers the flexibility of a 10-key pad and the convenience of 23 directly accessible functions. Screen manipulating functions make word processing a snap and cursor controls make the keypad ideal for VisiCalc™ users. The JE614 keypad is housed in a durable metal enclosure and is color-coordinated with your APPLE *IIe* computer. Operation of the keypad can begin within minutes from unpacking. Special functions include: Home, Clear, Clear to End of Screen, Scroll-Up, Scroll-Down, Tab, Delete, Left, Right, Up and Down. Each key has auto-repeat.

JE614 Assembled and Tested $89.95

Extended 80 Column/64K RAM Card for APPLE *IIe**



JE864

Now you can double the memory capacity and get an 80 column display format for your APPLE *IIe* computer at an affordable price. Just plug the JE864 card into your APPLE and expand your display to 80-characters per line. Perfect for word processing. The JE864 also features 64K bytes of additional memory to allow programming not possible with standard APPLE *IIe* computers.

Board: High density board design squeezes 64K bytes of RAM onto a 2½" x 4½" board • Fully tested to assure proper operation

Uses: Word processing — displays 1000 more characters per screen • Extra memory allows running of extremely large programs • Ultra High Resolution Graphics (when software available)

JE864 Assembled and Tested $149.95

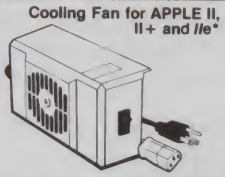
Switching Power Supply for APPLE II, II+ and *IIe**



• Can drive four floppy disk drives and up to eight expansion cards • Short-circuit and overload protection • Fits inside Apple computer • Fully regulated +5V @ 5A, +12V @ 3A, -5V @ 1A, -12V @ 1A • Apple-type plug in power cord included • Size: 9½"L x 3½"W x 2¼"H • Weight: 2 lbs.

Part No. KHP4007 $79.95

Cooling Fan for APPLE II, II+ and *IIe**



• Snaps on the side of APPLE II, II+ and IIe* enclosures • Eliminates overheating problems, thereby boosting reliability and operation life of computer • Switch on front of fan serves as power switch for fan, computer, and provided extra outlet

Part No. APF-1 $49.95

*APPLE and APPLE *IIe* are registered trademarks of APPLE Computers — **VisiCalc is a registered trademark of Visi Corp. Inc.



POWER SUPPLY +5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING

input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.6 amp. Fan volt./power supply select switches (115/230VAC). Output: 5VDC @ 7.6 amp, 12VDC @ 1.6 amp. 8 ft. blk. pow. cord. 11½"W x 13¾"D x 3¾"H. Wt. 6 lbs.

Part No. PS94VDS $39.95 each



POWER SUPPLY 4-Channel Switching - Apple Compatible

Microprocessor, mini-computer, terminal, medical equipment and process control applications. Input: 90-130VAC 47-440Hz. Output: +5VDC @ 5A, -5VDC @ 1A; +12VDC @ 1A, -12VDC @ 1A. Line reg.: ±0.2%. Ripple: 30mV p-p. Load reg.: ±1%. Overcurrent protection. Adj: 5V main output ±10%. 8-3/8"L x 1-7/8"W x 4-15/16"H. Wt. 1½ lbs.

Part No. FCS-604A $69.95 each

$10.00 Minimum Order — U.S. Funds Only
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Shipping — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sales Flyer!

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JE664 EPROM PROGRAMMER

8K TO 64K EPROMS — 24 AND 28 PIN PACKAGES

• Programs, validates, and checks for properly erased EPROMs • Emulates PROMs or EPROMs • RS232C Computer interface for editing/program loading • Loads data into RAM by keyboard • Changes data in RAM by keyboard • Loads RAM from an EPROM • Compares EPROMs for content differences • Copies EPROMs • Power Input: 115VAC, 60Hz, ◄ 10W power consumption • Enclosure: Color-coordinated, light tan panels w/molded mocha brown end pieces • Size: 15-5/8"L x 8¾"D x 3½"H • Wt.: 5¾ lbs.

JE664-A EPROM Programmer $995.00
Assembled & Tested (Includes JM16A Module)

JE665 — RS232C INTERFACE OPTION — The JE665 RS232C interface Option implements computer access to the JE664's RAM. Sample software written in BASIC provided for TRS-80® Model I, Level II Computer. Baud rate: 9600. Word lgth.: 8 bits - odd parity. Stop bits: 2. Option may be adapted to other computers. The JE665 can be interfaced to any computer with an RS232 port. Information is also provided for interfacing to any CP/M system with an RS232 port.

JE664-ARS EPROM Programmer w/JE665 Option $1195.00
Assembled and Tested (Includes JM16A Module)

EPROM JUMPER MODULES - The JE664's JUMPER MODULE (Personality Module) is a plug-in Module that pre-sets JE664 for proper programming pulses to the EPROM & configures EPROM socket connections for that particular EPROM.

P/N	EPROM	EPROM MANUFACTURER	PRICE
JM08A	2708	AMD, Motorola, National, Intel, TI (25V)	$14.95
JM16A	2716,TMS2516	Intel, Motorola, National, NEC, TI, (25V)	$14.95
JM16B	TMS2716	Motorola, TI (+5, -5, +12)	$14.95
JM32A	TMS2532	Motorola, TI (25V)	$14.95
JM32B	2732	AMD, Fujitsu, NEC, Hitachi, Intel (25V)	$14.95
JM32C	2732A (21V)	Fujitsu, Intel (21V)	$14.95
JM64A	MCM68764, MCM68L764	Motorola (21V)	$14.95
JM64B	2764	Intel (21V)	$14.95
JM64C	TMS2564	TI (25V)	$14.95

UV-EPROM Eraser

8 Chips — 51 Minutes



1 Chip — 37 Minutes

Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00" x 3.70" x 2.60". Complete with holding tray for 8 chips.

DE-4 UV-EPROM Eraser . . . $79.95

UVS-11EL Replacement Bulb $16.95



5¼" APPLE™ COMPATIBLE DISK DRIVE

• Uses Shugart SA390 mechanics • 143K formatted storage • 35 tracks — compatible with Apple controller • Complete with connector and cable — just plug into your disk controller card • Size: 8"L x 3½"W x 8-9/16"D • Weight: 4¼ lbs.

Part No. ADD-514 $195.95

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- Single-Sided
- 77 Tracks
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- Industry Standard

The FDD100-8 8" Floppy Disk Drive (industry) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250K bits/sec. single density; 500K bits/sec. double density. The FDD100-8 is designed to work with the single-sided soft sectored IBM Diskette I, or eq. disk cartridge. Power: 115VAC @ 50-60Hz, +24VDC @ 1.7 amps max., +5VDC @ 1.2 amps max. Unit as pictured above (does not include case, power supply, or cables). Size: 8.55"W x 14"L x 4.5"H. Weighs 12 lbs. Incl. 96-pg. manual.

FDD100-8 . . $169.95 ea.

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SAVE HUNDREDS OF $$$ BY UPGRADING MEMORY BOARDS YOURSELF!

Most of the popular memory boards allow you to add an additional 64K, 128K, 192K, or 256K. The IBM84K Kit will populate these boards in 64K byte increments. The kit is simple to install — just insert the nine 64K RAM chips in the provided sockets and set the two groups of switches. Includes: Manual.

IBM64K (Nine 200ns 64K RAMs) $49.95

EXPAND YOUR MEMORY

TRS-80 to 16K, 32K, or 48K

**Model 1 =	From 4K to 16K Requires (1) One Kit
Model 3 =	From 4K to 48K Requires (3) Three Kits
Color =	From 4K to 16K Requires (1) One Kit

**Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-16K3 *200ns for Color & Model III $12.95

TRS-16K4 *250ns for Model I $10.95

TRS-80 Color 32K or 64K Conversion Kit

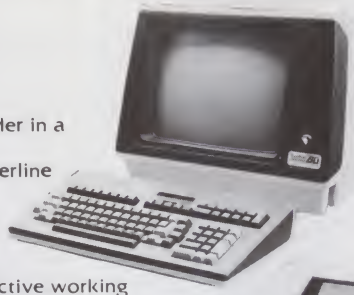
Easy to install kit comes complete with 8 ea. 4164-2 (200ns) 64K dynamic RAMs & conversion documentation. Converts TRS-80 color computers with E circuit boards, & all new color computers to 32K. Minor modifications of 32K memory will allow the use of all the 64K of the dynamic RAM providing you have a FLEX DOS operating system.

TRS-64K2 $44.95

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- 15" (38 cm) diagonal, yellow green phosper
- 24 lines × 80 characters (plus 25th status line)
- 80 × 24: 7 × 8 dot matrix plus 2 lower case descender in a 9 × 12 window
- Cursor is switch selectable as block or blinking underline
- EIA RS232C, Asynchronous
- 110, 300, 1200, 1800, 2400, 4800, 9600 or 19,200 baud, switch selectable
- Even, odd, 1, 0 switch selectable

Standard featurs include: Anti-glare screen; nonreflective working surfaces; color coded, contoured keyboard; convenient contrast control, reverse video and blinking fields; variable intensity; upper and lower case characters; line drawing graphics.

- $500.00 f.o.b. our warehouse

CONRAC RGB COLOR MONITOR

- 19 inch—high res.—10 mh
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- RGB video in $375.00
- Composite video in $475.00
- all prices f.o.b. our warehouses



Data Royal SERIAL PRINTER

- upper/lower case & graphics capability
- bidirectional, 132 character line
- RS232, 120 cps, ASCII, 7 × 9 dot matrix
- built in self test
- sprocket feed, 2½" to 15" width
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- $400.00 f.o.b. our warehouse

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- 24 × 80 characters
- 5 × 7 dot matrix
- full cursor control
- u/l case
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- 40 × 24 chars.
- black & white $35.00
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- all prices f.o.b. our warehouse

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- microprocessor controlled
- tractor & friction feed
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- 132 char. buffer
- full or half duplex
- parity—odd, even, none
- refurbished—excellent condition
- shp. wt. 100#
- $600.00 f.o.b. our warehouse

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Brand New!!!



- 40"h × 25"w × 24"d
- two compartments
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- smoke colored plastic top on hinges
- 155 lbs. shipping wt.
- $125.00 f.o.b. our warehouse

Keytronic Keyboards



- ASCII encoded
- +5 volts
- complete w/case
- new—never used
- shipping wt. 7 lbs.
- $45.00 f.o.b. our warehouse

Hazeltine 1410 Package

- Brand new Hazeltine 1410 terminal
 - 24 × 80 crs.—5 × 7 dot matrix
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- Bell 103 compatable direct line modem
 - auto ans./org.
 - 300 baud—RS 232
 - modular jack connectors
- RS 232 cable
 - male to male



- $375 fob our warehouse (shp. wt. 45#)



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• DB-25 m/m, m/f, f/f, 10 + '	—$10.00 ea. 3/$25.00
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• "muffin" fans (4½")	—$ 3.00 ea. 6/$15.00
• 3" quiet fan (steel frame)	—$ 3.00 ea. 6/$15.00
• RCA 4GB20 uhf/vhf-am antenna	—$15.00 ea.

Visa & MasterCard Accepted

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READER SERVICE

This card valid until February 29, 1984.

My vote for the best advertisement in this issue goes to _____ (company) whose Reader Service number is _____

A. Which microcomputing systems do you own? Check all that apply.

- ☐ 1. Apple II, II +, III
- ☐ 2. Apple IIe
- ☐ 3. Atari 400, 800
- ☐ 4. Atari 1200 XL
- ☐ 5. Commodore VIC-20
- ☐ 6. Commodore-64
- ☐ 7. Commodore/PET
- ☐ 8. Cromemco
- ☐ 9. DEC
- ☐ 10. Franklin Ace
- ☐ 11. Heath/Zenith
- ☐ 12. Hewlett-Packard
- ☐ 13. IBM PC
- ☐ 14. Kaypro
- ☐ 15. NEC
- ☐ 16. North Star
- ☐ 17. Osborne
- ☐ 18. PMC 80/81
- ☐ 19. S-100 based system
- ☐ 20. Sanyo
- ☐ 21. Texas Instruments
- ☐ 22. Timex/Sinclair
- ☐ 23. TRS-80
- ☐ 24. Xerox
- ☐ 25. Other _____

Which of the following systems do you plan to buy during the next 12 months?

- ☐ 26. Apple Lisa
- ☐ 27. Apple IIe
- ☐ 28. Atari 1200 XL
- ☐ 29. Commodore-64
- ☐ 30. Compaq
- ☐ 31. Epson HX-20
- ☐ 32. Epson QX-10
- ☐ 33. Franklin Ace
- ☐ 34. Hyperion
- ☐ 35. IBM XT PC
- ☐ 36. Morrow Micro Decision
- ☐ 37. North Star Advantage
- ☐ 38. Osborne Executive
- ☐ 39. Otrona Attache
- ☐ 40. Panasonic JR-200
- ☐ 41. Sony SMC 70
- ☐ 42. Texas Instruments Compact
- ☐ 43. Texas Instruments Professional
- ☐ 44. Timex/Sinclair 2000
- ☐ 45. TRS-80 Model 12
- ☐ 46. TRS-80 Model 16
- ☐ 47. Tandy Model 100
- ☐ 48. Zenith 100
- ☐ 49. Zorba
- ☐ 50. Other _____

B. How much have you invested in computer hardware (including peripherals) during the last 12 months?

- ☐ 1. Nothing
- ☐ 2. Under $500
- ☐ 3. $500–$1,000
- ☐ 4. $1,000–$1,500
- ☐ 5. $1,500–$2,000
- ☐ 6. Over $2,000

C. How much do you plan to spend on computer hardware during the next 12 months?

- ☐ 1. Nothing
- ☐ 2. Under $500
- ☐ 3. $500–$1,000
- ☐ 4. $1,000–$1,500
- ☐ 5. $1,500–$2,000
- ☐ 6. Over $2,000

D. How much have you invested in computer software during the last 12 months?

- ☐ 1. Nothing
- ☐ 2. Less than $100
- ☐ 3. $100–$250
- ☐ 4. $250–$500
- ☐ 5. $500–$1,000
- ☐ 6. Over $1,000

E. How much do you plan to spend on software during the next 12 months?

- ☐ 1. Nothing
- ☐ 2. Less than $100
- ☐ 3. $100–$250
- ☐ 4. $250–$500
- ☐ 5. $500–$1,000
- ☐ 6. Over $1,000

F. Do you influence friends or business associates' purchases of computing equipment?

☐ 1. Yes ☐ 2. No

G. What do you consider the *best* source of information about computers? Check one only

- ☐ 1. Computer magazines
- ☐ 2. Other magazines
- ☐ 3. Newspapers
- ☐ 4. Books
- ☐ 5. Seminars/courses
- ☐ 6. Word of mouth
- ☐ 7. Other _____

H. If you use a microcomputer at work, what is your primary application?

- ☐ 1. Word Processing
- ☐ 2. Database Management
- ☐ 3. Other Business
- ☐ 4. Home Finance/Household
- ☐ 5. Education
- ☐ 6. Scientific/Technical
- ☐ 7. Programming/Data Processing
- ☐ 8. Hardware Design
- ☐ 9. Graphics
- ☐ 10. Other _____

I. For the most part, the articles in *Microcomputing* are

☐ 1. Too simple ☐ 2. Too complex ☐ 3. Just right

L. Which of the following columns do you read? Please rate them on a scale of 1 (seldom read) to 5 (always read).

- ____ 1. Publisher's Remarks
- ____ 2. What's New, Big Blue?
- ____ 3. Dial-up Directory
- ____ 4. PET-pourri
- ____ 5. Micro Software Digest
- ____ 6. Conversions
- ____ 7. Book Reviews
- ____ 8. New Software
- ____ 9. New Products
- ____ 10. Software Reviews

M. If you are not a subscriber, please circle 500.

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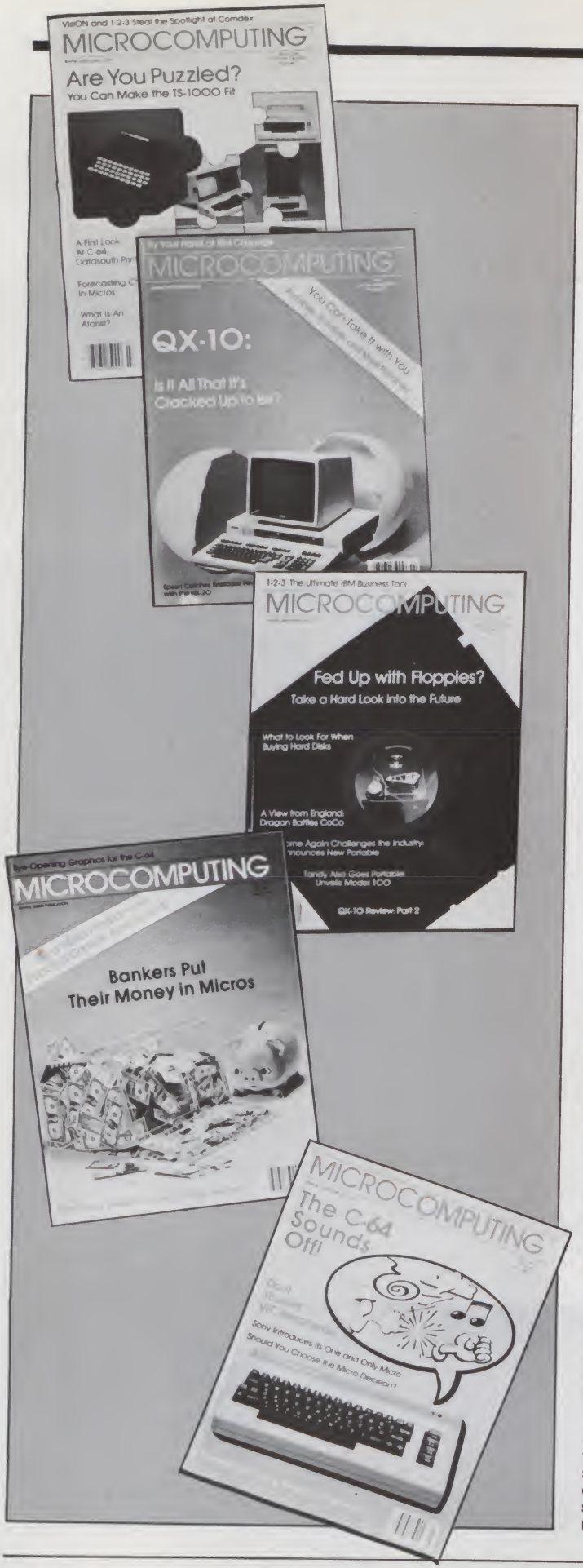
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Micro Software Digest

Compiled by Tracy Mayor

Micro Software Digest presents capsulized software reviews from various computer-related publications.

MemoPlan

System Requirements: Any computer running PC DOS, MS DOS, CP/M-80 or CP/M-86; 64K RAM; one 150K disk drive; printer
Manufacturer: Chang Labs, 5300 Stevens Creek Blvd., Suite 200, San Jose, CA 95129
Price: $195
Comments: According to the review, MemoPlan's outstanding asset is the "ability to capture thoughts as they occur, without the burden of opening, closing and transferring files."

The program is a memo- or letter-oriented word processor that supports automatic save, a crash utility and the ability to cancel commands at any time.

Split-screen abilities and text enhancement features are also included. In short, MemoPlan provides the "writing features necessary to complete most writing tasks." Reader Service number 406.

(Reviewed in InfoWorld, *October 10, 1983)*

Micro Link II Version 1.10

System Requirements: CP/M, MS DOS or CP/M-86
Manufacturer: Digital Marketing Corp., 2363 Boulevard Circle, Suite 8, Walnut Creek, CA 94595
Price: $89
Comments: With the growth of the micro industry, intercomputer communication is becoming increasingly necessary. Micro Link II allows you to log onto time-sharing systems, information services or other micros, directly or with a modem.

Micro Link can send or receive almost any type of file and all types of data at 300, 1200 or 9600 baud. Up to 20 standard phrases can be saved and sent by number.

The review concludes, "If you need computer-to-computer communication, Micro Link II is for you." Reader Service number 403.

(Reviewed in InfoWorld, *September 26, 1983)*

Daisy-Aids

System Requirements: 8080- or Z-80-based system; CP/M 2.0; 48K RAM; 5¼- or eight-inch disk drive; daisy-wheel printer
Manufacturer: Escape Computer Software, Inc., PO Box 1771, Roswell, GA 30075
Price: $275
Comments: Daisy-Aids is designed to graph almost any information you need to present using the plot mode of most letter-quality printers. You can chart line, bar or scatter graphs. There's also a great deal of flexibility for titles and labels on all axes of each graph.

New parameters can be saved in place of existing ones. There's also a built-in editing mode and, if your printer has the option, color capabilities. Fixed variable selection is designed to eliminate errors. "If you need to generate charts and graphs," the program is highly recommended as being "worth its price." Reader Service number 411.

(Reviewed in InfoWorld, *October 17, 1983)*

Master Grades

System Requirements: PET with 32K and CBM disk drive or Apple II with 16K and 3.3 DOS
Manufacturer: Midwest Software, Box 214, Farmington, MI 48024
Price: $39.50
Comments: Gone are the days when precocious students could steal the teacher's grade book—now there's a program to keep academic records on disk and away from inquisitive eyes.

Master Grades, written in compiled Basic, keeps track of both grades and attendance. There are also six print options, including a progress letter to parents. The program allows the teacher to set both points and relative weight for each grade. Each teacher can keep tabs on up to 200 students. A source code is also provided—just in case. Reader Service number 405.

(Reviewed in Micro, *September 1983)*

Simplifile

System Requirements: Any CP/M system
Manufacturer: Durant Software, 2532 Durant Ave., Berkeley, CA 94704
Price: $100
Comments: As the review observes, some operating systems "can make many new users yearn for their pencils, scratchpads and typewriters." Simplifile is designed to alleviate operating system problems, especially for neophytes. It's a front-end program that offers additional identification information on files, allows files to be chained and facilitates the file backup process.

The file description function lets you enter up to 42 characters to pinpoint exactly what's in each file. The review recommends, "Simplifile is an excellent utility which offers advantages to any user." Reader Service number 401.

(Reviewed in InfoAge, *October 1983)*

muMath

System Requirements: IBM PC; 64K RAM; one or two disk drives
Manufacturer: The Soft Warehouse, Box 11174, Honolulu, HI 96828
Price: $250
Comments: Most mathematical computations on computers are usually done by numerical methods, but symbolic mathematics (computer algebra) is actually better suited for general problem solving. muMath, says the review, "performs exact arithmetic and symbolic manipulation just as people do (without the errors)."

muMath can handle extremely large numbers and complicated functions easily. Matrix algebra, symbolic differentiation and integration are also part of the repertoire. The program is written in muSimp language, which is a cortex phrase for an internal Lisp interpreter. Reader Service number 409.

(Reviewed in Softalk for the IBM Personal Computer, *August 1983)*

Money Street

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; at least one disk drive
Manufacturer: Computer Tax Service, Box 7915, Incline Village, NV 89450
Price: $99.95
Comments: If you're having trouble tracking down your transactions, Money Street may be for you. According to the review, the program is for everyone, from "scared-stiff computerphobes to CPAs." Money Street covers all aspects of personal money management, including checks, charge cards, automated teller transactions and budgets.

Money Street also prints running totals of tax deductions and income, so it's also possible to estimate next year's taxes ahead of time. A code dictionary allows for customized categorizing of any aspect of the program. The program easily takes care of your money management—however, income generation is still up to you. Reader Service number 404.

(Reviewed in Softalk, *September 1983)*

Random House Courseware

System Requirements: TRS-80 Model III; TRS DOS 1.3 with 48K or 16K cassette and 5¼-inch disk drive or 16K cassette
Manufacturer: Random House School Division, 400 Hahn Road, Westminster, MD 21157
Price: Word Count: $60 disk or $39 cassette; Word Mount: $66 disk or $45 cassette; Telling Time: $57 disk or $45 cassette
Comments: This educational package is composed of three programs: Telling Time, Word Mount and Word Count. Telling Time, designed for kindergarten level and above, teaches time telling in hour, half-hour and quarter-hour installments through matching exercises.

Both Word Mount and Word Count are aimed at increasing vocabulary and developing thinking skills. Word Count presents the child with a word and he or she must create new words using the same letters. Word Mount asks for rhyming words.

Word lists can be adapted. All three are easy to use and include sample problems and built-in directions. Programs can even be a challenge for adults. The reviewer enthuses, "They are a welcome relief in a sea of overpriced and sloppy software." Reader Service number 412.

(Reviewed in InfoWorld, *October 24, 1983)*

Grammatik

System Requirements: TRS-80 models I, II or III, Apple II, IIe or III with CP/M card, IBM PC, Osborne 1 or any other CP/M- or MS DOS-based system
Manufacturer: Aspen Software Co., PO Box 339, Tijeras, NM 87059
Price: $75
Comments: As the review observes, spelling checker programs take you only halfway toward perfect professional writing—"cleaning up grammar and searching for apt synonyms is much more time consuming." Grammatik is aimed directly at these literary nemeses.

Based on the prodigious *Chicago Manual of Style* and *The Elements of Style*, Grammatik analyzes your document for total word count, average word and sentence length and the number of "to be" verb phrases. It also spots outdated phrases, capitalization errors and a host of other common grammatical mistakes. Reader Service number 408.

(Reviewed in Popular Computing, *September 1983)*

Market Analyzer

System Requirements: IBM PC; 64K; at least one disk drive; DOS 1.10; BasicA; RS-232C serial port; an Epson or IBM printer with Graftrax Plus is helpful
Manufacturer: Dow Jones and Co., Inc., PO Box 300, Princeton, NJ 08540
Price: $349
Comments: Dow Jones, no slouch in stock market circles, has produced a program that works in conjunction with its News/Retrieval service to help technical analysts peer into the investment future.

Market Analyzer's abilities are twofold: The program can retrieve historical information on specific stocks and then chart the results.

The review says, "The heart of the Market Analyzer is its charting functions." You can graph a single stock over time or compare up to five accounts at once. Stocks can also be compared against the Dow Jones Industrial Average. Technical knowledge is necessary—as the review observes, "Like a hammer in the hands of a skilled carpenter, it can be used to create great things." Reader Service number 402.

(Reviewed in PC World, *November 1983)*

Bookends

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; at least one disk drive
Manufacturer: Sensible Software, 6619 Perham Drive, West Bloomfield, MI 48033
Price: $124.95
Comments: Raves this review, "Sensible's programs do what they say they will and do it well . . . with Bookends, Sensible has outdone itself." The program is a reference management system for anyone who keeps extensive files on periodicals, books, records, movies or software.

Sorts are quick, editing is "cinchy" and it's possible to find a reference with only a few bits of knowledge—the program relies on an extensive keyword function that can find even the most obscure connections.

Concludes the review, "If you have no use for a reference management system, create one—this package is just about worth it." Reader Service number 410.

(Reviewed in Softalk, *August 1983)*

InfoAge, published by Plesman Publications, Ltd., 211 Consumers Road, Suite 302, Willowdale, Ontario, M2J 4G8, Canada.

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Softalk and *Softalk for the IBM Personal Computer*, 11160 McCormick St., North Hollywood, CA 91601.

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CALENDAR

Computer Lectures at USC

The Annenburg School of Communication at the University of Southern California is hosting a series of lectures focusing on various aspects of the computer industry.

On January 11, William Zinsser, executive editor of the Book-of-the-Month Club, will speak on Word Processing and Creative Expression. For further information on the five-part series, contact Diane Woods at 213-743-5976.

Public Course Offerings

Ken Orr and Associates, a systems technology research and development company, is offering two public courses this month. Structured Requirements Definition will be on January 10–13 in Los Angeles, CA and Structured Program Design/Maintenance will be on January 23–27 in Dallas, TX.

For more information, contact Georganna Carson, Ken Orr and Associates, Inc., 1725 Gage Blvd., Topeka, KS 66604; 800-255-2459 or, from within Kansas, 913-273-0653.

Sauk Valley Computer Fair

The Sauk Valley, IL, Computer Club will host the Fourth Annual Computer Fair January 14 and 15, 1984. The fair will be held at the Northland Mall, Rt. 2 in Sterling, IL.

For more information, contact Vinus Williams, Rt. 1, Millegeville, IL 61051; 815-625-8585 days.

IIE Seminars—Atlanta

The Institute of Industrial Engineers will host two seminars in January. On January 16 and 17, the topic will be Robotics—Equipment, Applications and Methodology. On January 19 and 20, a conference will cover Effective Utilization of Microcomputers for the industrial engineer.

Both shows will be held at the IIE Education Center in Norcross, GA. For more information, contact the IIE Conference Department, 25 Technology Park/Atlanta, Norcross, GA 30092; 404-449-0460.

UNIX in the Capital

UNIFORUM, a user's group conference for people who use the UNIX operating system, will be held January 16–20, 1984, in Washington, D.C. The conference is being cosponsored by USENIX and Software Tools.

Meetings are to be held all week long, and exhibits are scheduled for January 17–19. For more information, contact Mark Weber at Professional Exposition Management Company, Suite 205, 2400 East Devon Ave., Des Plaines, IL 60018; 800-323-5155 or, in Illinois, 800-312-299-3131.

Southcon and Mini/Micro in Florida

The Orange County Convention/Civic Center will host two shows January 17–19, 1984. Southcon/84 is billed as a High-Technology Electronics Exhibition and Convention.

The show will share the hall with Mini/Micro Southeast-84, which specifically focuses on computers. For more information on either show, contact Nancy Hogan or Kent Keller at 213-772-2965.

Software Opportunities in Japan

A two-day seminar entitled Software Business Opportunities in Japan will be held January 26 and 27 in Monterey, CA.

Top Japanese and American computer and legal experts will be on hand to discuss marketing strategies. Seminar topics also include distribution, licensing and competition. Several keynote speakers will address the group. For more information, contact Patsy Vyner Hawks at Technology Analysis Group, Inc., 202-483-6642.

Computers in the Cocoanut Grove

The second annual Santa Cruz Computer Festival will be held February 3–5 at the Cocoanut Grove on the Santa Cruz Boardwalk. Feb. 3's program will focus on business and agricultural uses of the computer and Feb. 4's schedule will address educators.

Both days will feature displays, demonstrations and workshops. Seminars will discuss the computer job market and offer guidelines on purchasing systems. For more information call Judy Immerman at 408-425-1503.

Yankee Gatherings

The Yankee Group will hold two IBM seminars in February. The New York show will be on February 7 and 8 and the San Francisco show is scheduled for February 14 and 15.

For more information, write or call Lisa Caruso, Seminar Director, 89 Board St., Boston, MA 02110; 617-542-0100.

ICCs in the European Theater

The European Spring Series of the Invitational Computer Conference kicks off in Stockholm, Sweden, on February 21. The ICCs are one-day, by-invitation-only conferences directed at a select audience of volume buyers. Each show features displays of operating equipment and technical seminars.

Paris will host an ICC on February 23 and Munich, West Germany, is the site of a show on February 28. For more information, write or call B.J. Johnson and Associates, 3151 Airway Ave., #C-2, Costa Mesa, CA 92626; 714-957-0171.

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The Egyptian Management Information Center, 93 Kasr Eleiny St., Cairo, Egypt, phone 27525, telex 92185, Hapi Un, is looking for interested manufacturers to market their hardware and software in Egypt and the Middle East. Contact Adel Fahmy, Ph.D.

For Sale: Atari 400 with 4 yr. guarantee on 40K chip, Basic Cart. and Atari 410 for $250. Lenny Raniera, 32-03 20th Road, L.I.C., NY 11105.

For Sale: Two TRS-80 Model I disc drives to be used with a 16K Level II Basic TRS-80 microcomputer. One is catalog #26-1160; one is #26-1161. $800 each. Anne Heitz, 2807 Avenue C, Ft. Madison, IA 52627; 319-372-3058.

Wanted—Your surplus electronic components: ICs, transistors, diodes, ribbon cable, connectors, etc. for my parts stash. Will pay COB (cash on barrelhead). Bill Kleronomos, 4815-E Whiterock Cr., Boulder, CO 80301; 303-530-1281 eves.

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BOOK REVIEWS

Edited by Larry Canale

A New Standard in Graphics Books, and . . . A "Fairly Complete" Graphics Complement Salvation for Your Systems House Start-Up

Computer Graphics for the IBM Personal Computer

Donald Hearn and M. Pauline Baker
Prentice-Hall, 1983
Englewood Cliffs, NJ 07632
Hardcover, 330 pp., $18.95

Donald Hearn and M. Pauline Baker, both from the computer science department at Western Illinois University, have written a marvelously readable and exceptionally useful book on computer graphics for the IBM PC. In *Computer Graphics for the IBM Personal Computer*, they cover everything from what a "system unit" is (the computer sans keyboard) through character graphics and pixel graphics ("real" graphics).

The book is written in a readable style, with a liberal number of full programs you can enter and run and with full-color photographs and even study questions at the end of each chapter.

Computer Graphics contains 14 chapters and two appendixes; within this subdivision, there are some 118 programs and 16 full-color photographs.

The authors start slowly, with a chapter devoted to "what makes the system tick, how the different hardware components function and what options are available for expansion boards, video monitors and other input-ouput devices (p. xvii)."

Assuming you can get through the first chapter and the second—on character graphics for the PC (in which the *de rigueur* picture of a snowflake rears its ugly head)—the rest of the book is dynamite.

Thankfully, the first two chapters take up only 30 pages, leaving a lot of room for learning about what we came to learn.

The next section of the book (Part II) deals with plotting points, lines, color, shading and the Draw command (Chapter 3).

Next, some fundamentals of graphing are covered through simple bar graphs. An entire chapter is devoted to curve drawing, with good coverage of the Circle statement and some applications in the form of pie-charting. Part II closes with menu creation, light pen usage and joystick/paddle peripherals as alternative data input/control techniques.

The authors include useful programs for each of these discussions. For instance, the one on menu control of graphics programs has a 59-line etch-a-sketch program that is sound coded, works well and is fun to boot.

Part III of the book covers more advanced graphics topics under the title of "Display Manipulations." The chapters here are devoted to data transformations (e.g., rotation, zooming and the like), animation and graphics windows, spotlighting and viewporting.

Since *Computer Graphics* is current only through Basic 1.1 graphics commands, some of the techniques for viewporting, for instance, are outmoded with the new Basic 2.0 capabilities that automate them. Nonetheless, the discussion is sound, the program examples excellent and the learning profound.

Part IV gets to the tough stuff—three-dimensional displays. Hidden lines and surfaces, perspective views and shading and highlighting are covered, as are scaling, rotation and other transformations of 3-D imaging. This section, like the others, is replete with 12 different programs, ranging from 3-D bar graphs to surface plotting of a sine wave in three dimensions.

Part V involves applications of all of these tools. The authors cover business graphics (including project management graphs), educational graphics (like drill and practice programs as well as simulations) and "personal graphics" (by which the authors mean household financial graphing and game-playing).

Again, some 16 programs, ranging from PERT-charting to modeling the solar system with rotating moon and earth, are presented for your erudition, coding and enjoyment.

Judging by Its Cover

As if all of this isn't enough, the book is hardbound, professionally produced and has appendixes with PC screen-tailored graph paper to aid in your own graphics programming adventures. It also contains excellent exercises at the end of each chapter so you can apply what you learned.

Best of all, the writers fought off the academic tendency to write dry, dull copy with a lot of teaching but no relevance. They kept my interest throughout (mostly because of their programs).

I keyed in about ten of the programs in the book, and I couldn't find a bug. Unlike most published code, Hearn and Baker seem to have taken pains to make sure theirs is "clean."

The only negatives are:

1. The book did not come with a floppy disk, forcing the user to key in the programs (a major negative; I just *have* to assume a disk will be available shortly).

2. The text does not cover the new Basic 2.0 commands on world and screen coordinates (although *how* to convert from world to screen coordinates is covered nicely in the text and by program examples).

3. The "Applications" section of the book struck me as weak.

This latter criticism is not one directed at the authors, who strove mightily to show how to pie-chart personnel division expenditures (in the business section), how to graph caloric intake of various foods and even biorhythms (in the personal section) and how to do graphics drills (in the educational section). It's rather an indication that much of the true power of graphics on the PC has not been put to work in traditional applications in a useful way, because graphics programming is damned difficult even with the PC's power.

That the authors have been able to unlock the secrets of graphics on the PC so that even limited applications can be pursued effectively, however, is a major accomplishment. *Computer Graphics* may be the standard graphics text on the PC for some time to come.

Thomas Bonoma
Concord, MA

Graphics Programs for the IBM PC

Robert J. Traister
Tab, 1983
Blue Ridge Summit, PA 17214
Softcover, 243 pp., $15.50

In 243 pages, author Robert Traister has provided a fairly complete anthology about PC screen graphics, as performed

using Basic. Not restricted to color, *Graphics Programs for the IBM PC* concentrates on text graphics for the monochrome display as well.

Written in an easy-to-read and conversational style, this book befriends the reader and leads him gently into and through the topic.

It doesn't lead him quickly, however—it would appear that a conscious effort was made to flesh out the book in terms of pages. After telling us in the introduction that graphics is habit-forming, Traister takes until p. 160 to get to the part he calls "fun."

Once beyond his introductory remarks, Traister gets into solid meat. He leads you largely into screen graphics, some of which appear in the book in color.

Unfortunately, Tab chose to cut production costs and didn't use nearly as much color as it should have. Had there been more color plates, this book would have been much more of a value.

The book is good, but it did leave some questions. It should have included a discussion about dot-addressable graphics for the graphics printers. Just how does Sideways work? Are the only graphics outputs those that are first developed on the screen?

Graphics Programs for the IBM PC is strong in the areas of drawing, the animation of a picture and the allocation of color. If you wish to draw lines, circles, arcs, squares and rectangles and to complete the coloring, then this book will tell you how.

That which this book contains is good, valuable, useful and workable. But the book's claim that it will help you to "use the full graphics potential of your IBM PC" may be overstated.

Kenniston Lord
Winchendon, MA

How to Start Your Own Systems House

Leslie Nelson
Essex Publishing, 1982
285 Bloomfield Ave.
Caldwell, NJ 07006
Softcover, 120 pp., $36

Want to dump your 9–5 job to become a computer entrepreneur? You'll probably fail. Most people do—but Essex Publishing is determined to make sure you beat those odds.

This company has a series of books that will give you an MBA from the School of Hard Knocks. Fortunately, author Leslie Nelson has done all of your homework.

Nelson obviously knows how to run a successful systems house, as evidenced by his book *How to Start Your Own Systems House*.

First, he defines just what a systems house is. Then he points out the limitless market and leaves you panting for the chance to begin. Don't worry, it'll come.

Nelson lists three types of systems houses. One writes custom software for any application—too expensive for small systems. Another sells off-the-shelf software for every application—too inflexible and superficial. The last type develops, modifies and tailors its specialized software to a specific sector of industry. Nelson overwhelmingly demonstrates that the last is the only course to take.

At this stage, Nelson has already supplied an invaluable pearl to the reader. He has forced the entrepreneur to concentrate his aims and energy on one goal. Trying to be all things to all people is the perfect formula for failure in business.

Nelson's next four chapters concentrate on building up your stock of hardware and software. If you're going to sell this stuff, you had better know what it does and what it doesn't do. That's what you're going to get paid for.

The author tells precisely how to contact suppliers, how to advertise and how to recruit sales staff. These chapters will be useful to anybody planning to go into retail business, whether it be computers or widgets.

The next section of the book shows that Nelson is not a newcomer to the world of sales. Here you learn how to advertise your service, how to price it and how to convince your customer that he needs you. The author doesn't use vague principles or theories that look fine in class; he gives concrete examples.

"How to Answer the Twelve Objections Most Frequently Raised by Prospects" could be a book in itself. Obviously, Nelson has had suspicious customers question his finances, ethics and ability. I'll bet most of these doubting Thomases later bought their own systems.

So now that you have your company running successfully, are your troubles over? "No way," says Nelson. "Now you must fight to keep it solvent." He goes on to tell you how, and once again, his suggestions on protecting your assets, your share of the market and your sanity are specific and invaluable.

The examples in *How to Start Your Own Systems House* are as useful as the advice. I have lost count of the specific cases Nelson uses from his own experience to illustrate his points. There are 12 forms, for such matters as sales agreements, lease arrangements and accounting procedures. These will not substitute for specific agreements drawn up in cooperation with your accountant and lawyer, but they'll show you what to be looking for.

Nelson has successfully distilled his experiences and presented them in a manageable package. In summary, this unassuming book should be on the shelf of everyone considering setting up a systems house.

Bruce Evans
Pickering, Ontario
Canada

From the *MC* Bookshelf

A user's group for a book? It's a novel idea, anyway . . .

Author Eric Burgess started a user's group after being flooded with modifications to his Apple II programs in *Celestial Basic: Astronomy on Your Computer* (Sybex, 2344 Sixth St., Berkeley, CA 94710; softcover, 228 pp., $13.95).

Burgess has just finished work on a sequel. In *More Uses for Your Timex/Sinclair 1000: Astronomy on Your Computer*, Burgess was able to "use many of the suggestions from the *Celestial Basic* user's group," he said.

New and Noted

New graphics books you may want to check out include *Graphics Primer for the IBM PC* (Osborne/McGraw-Hill, 2600 Tenth St., Berkely, CA 94710; softcover, 430 pp., $21.95).

Authors Mitchell Waite and Christopher Morgan have written an impressive, colorful guide explaining how to create hires graphics. The book provides tips for programming pie charts, bar graphs, maps and two- or three-dimensional pictures.

Atari owners may be interested in *Advanced Programming Techniques for Your Atari, Including Graphics and Voice Programs*, by Linda M. Schreiber (Tab, Blue Ridge Summit, PA 17214; softcover, 207 pp., $14.50). Tab also has released *25 Graphics Programs in Microsoft Basic*, by Timothy J. O'Malley (softcover, 150 pp., $10.95).

A myriad of books is available for small-business owners interested in computerizing their companies.

A Guide for Selecting Computers and Software for Small Businesses, by Paul G. Enockson (Reston, 11420 Sunset Hills Road, Reston, VA 22090; hardcover, 109 pp., $19.95), offers advice on how to best use hardware and software in organizing your business.

Word Processing for Small Businesses, by Steven Jong, offers the same type of assistance, providing information on the different computers, printers and software available. It's published by Howard W. Sams & Co. (4300 W. 62nd St., Indianapolis, IN 46268; softcover, 190 pp., $11.95).

Who?

For owners of machines no longer being manufactured, there's Ken Lord's *Using the Osborne Personal Computer* (Van Nostrand Reinhold Co., 135 W. 50th St., New York, NY 10020; softcover, 324 pp., $13.45) and Steve Davis's *Programs for the TI Home Computer* (Prentice-Hall, Englewood Cliffs, NJ 07632; softcover, 126 pp., $14.95). The latter features nearly 50 useful and unusual programs for Texas Instruments 99/4 and 99/4A owners.

L.C.

Edited by Sheila Wright

Accounting in Color on NEC's APC
Managing with Metafile
Get Ready for the IRS with Softax
CIP: A DP Manager for Your IBM

Micro Business Bundle

The MBA Accountant is a color accounting software package that includes General Ledger with financial report writer, Accounts Receivable with invoicing and Accounts Payable with check writing.

MBA's programs are written to utilize the color capabilities of the Advanced Personal Computer. Its full-screen data entry and review use word processing functions and display screen titles, data fields and error messages in three different colors. Color allows you to easily spot important items. You can define your own color or use a standard color screen.

A database integrates MBA's programs to eliminate the process of reentering and storing the same information. This also reduces disk storage space and provides an efficient verification of updated and edited information online.

The package also contains sample data that allows you to practice before entering company data. The manual contains an "Introduction to Accounting" section, which explains the basic principles of accounting and the effect that computerized bookkeeping has on a company's books. Each application is presented with both written and visual illustrations in a step-by-step format.

The MBA Accountant may be integrated with all of the MBA applications available for the NEC APC. These include Multi-State/Local Payroll with check writing, Inventory Control with invoicing, Purchase Orders and requisitions, Fixed Asset Accounting, Professional Time Accounting and Multi-Company Option.



The MBA Accountant adds color to finances.

The MBA Accountant, for the NEC APC 16-bit computer, sells for $1495 from Micro Business Applications, 12281 Nicollet Avenue S., Burnsville, MN 55337. Reader Service number 464.

Metafile for Management

Metafile, an information management system, integrates several features into one program.

Using Metafile's integrated facilities, you can

- Prepare reports, menus, documents, data entry forms, letters and spreadsheets;
- Merge data with text to generate reports and mailing lists;
- Link spreadsheets to data files or other spreadsheets;
- Combine information into multiple screen windows to form composite reports;
- Generate simple to complex applications for a wide range of needs.

Metafile retails for $995 and is available for the IBM PC or XT and the Compaq, and for PC DOS 1.1 or 2.0 operating systems. For more information, contact Sensor-Based Systems, 15 East Second St., Chatfield, MN 55923-1297. Reader Service number 474.

Correction: OpVal stock option software, from CalcShop, Inc., (*Microcomputing*, November 1983, p. 132) is designed for the Apple II, II Plus and IIe. It can run on the Apple III with an emulator. The program takes only 18 seconds to evaluate 96 stock options.

Softax for Apple

Design Trends has released Softax, a tax preparation and simulation program for the IBM PC or XT or the Apple II, IIe or III. Its entry schemes use VisiCalc to speed and simplify data entry. All forms and schedules are printed for direct submittal to the IRS.

Softax's features include a batch print capability that allows preparers to print returns for multiple clients with one command; A Proforma, or Organizer, that can be mailed to clients at the end of the year to show the prior year's figures; and a print parameter file that can set options. Preparer information for printing is also included.

Softax has a simulator that shows current tax positions based upon either detailed or summary entry. You can enter net change amounts to income and adjustment categories for analysis as well as assess the impact of various tax scenarios. Softax can use either this year's or next year's tax tables for simulation purposes.

The program is available in three versions. If you want to prepare your own return, you can buy the Individual

version for $199. A Preparer's version of 1040 returns is available at $499. A Professional version that contains individual, trust, partnership and corporate returns is available for $850. A demonstration system is available for $25.

Softax is from Design Trends, Ltd., Box G, 644 Danbury Road, Wilton, CT 06897. Reader Service number 461.

CIP: IBM DB Manager

Concentric Information Processor (CIP) is an IBM database/information management and report writing program that requires no command language. Its visual interface feature lets you see report-writing results onscreen as they'll appear in final reports.

CIP features a calculation facility, including a date arithmetic, that lets you handle business applications.

Other applications include:

- An underlying file structure that supports information;
- In-place file reorganization;
- Context-sensitive instructions, key graphics and help screens;
- The consistent use of command keys and pointing techniques.

CIP interacts with such products as VisiCalc, 1-2-3 or MailMerge. It also can read files from pfs or dBaseII.

CIP accommodates the complex needs of business, professional and personal recordkeeping and report writing. Typical applications include inventory control, customer files, asset management, tickler files, order tracking, invoicing, mailing labels and directory lists.

CIP, which sells for $395, is available from Concentric Data Systems, Inc., 18 Lyman St., Westboro, MA 01581. Reader Service number 460.

Prepare for SATs On Apple, IBM or C-64

Barron's Computer Study Program for the SAT is a software tool designed for students preparing for college entrance exams.



Students can prepare for the SAT's with Barron's Computer Study Program.

The program comes with three two-sided disks with color and sound effects, a user's manual and study guides for Mathematics and Verbal sections of the exams.

A student can take four full-length simulated SATs in either the Question Mode (with feedback on each question) or in the Test Mode (for uninterrupted and timed test-taking).

In the Question Mode, the computer will supply:

- A complete explanation of the correct answer;
- An explanation of wrong answer choices for verbal questions;
- Problem-solving strategies for math questions;
- A hint and a second chance to correct the wrong answer.

In addition, the computer will calculate the student's scores, including a scaled SAT score and the percentage of correct answers in 42 skill areas.

Once the computer analyzes the student's strengths and weaknesses, a personal study program is created. It includes numerous computer drill items, sample math problems and step-by-step solutions, as well as review material and exercises in the SAT text and workbooks. In addition, the software includes sample math problems with solutions that appear on the screen one step at a time.

Barron's Educational Series, Inc. (113 Crossways Park Drive, Woodbury, NY 11797), sells its Computer Study Program for the Apple II, II Plus and IIe, IBM PC or Commodore-64 for $79.95. Reader Service number 465.

A TRS-80 Fitness Tool

Toolkit1 is a set of five programs for development and maintenance of TRS-80 Models III and 4.

The five programs are Pager, Pack, Compare, Rebackup and Copyfile.

Pager permits formatted listings of Basic programs, allowing for left margin, indentation, page title and number capabilities. It also has the ability to skip past perforations and to show the count of bytes, lines and pages in a listing.

Pack provides selective removal of remarks and nonprinting spaces or both. It also lets you limit the packing to a selected block of line numbers.

The Compare program examines several versions of Basic to show their differences and to provide a documented track of changes in hard copy.

Rebackup and Copyfile let you make safety backup copies of protected programs. They operate quickly, taking only 2.5 minutes to make a typical copy. Keyboard responses are prompted by the screen display.

Toolkit1 gives you better control of protected software and reduces the risk of losing your backup copy.

A 48-page operating manual explains the MBA Accountant and presents special computer techniques.

Toolkit1 requirements include one disk drive and at least 32K of memory. It's provided on disk for TRSDOS 1.3.

The price of Toolkit1 is $89.90. It's available from Data Associates, Box 882, Framingham, MA 01701. Reader Service number 462.

Venture with IBM

Venture, an enhanced computer timesharing program for the IBM PC or XT, allows you to perform business and strategic plans as well as capital investment analyses.

The program contains accounting procedures, logic

features, calculations and reports. You can specify parameters and enter data without writing equations or designing reports.

Venture reports include Income Statement, Balance Sheet and Source and Application of Funds. To interface with your text editing or word processing system, you can display reports on your screen or printer or you can write to disk in ASCII Text File format.

Venture makes extensive use of all screen menus and function keys and includes a help facility. It also makes automatic calculations of depreciation, cash and debt. It can model existing businesses, new ventures or capital projects.

Venture's full repertoire of interactive English commands allows data projections using growth rates, 11 depreciation methods, a consolidation of models, a method factor data for inflation or currency conversion and an on-line model documentation.

Venture is available for the IBM PC or XT with PC DOS 1.1 or 2.0, any monitor, two single- or one double-disk and 192K. It sells for $495 from Weiss Associates, Inc., 127 Michael Drive, Red Bank, NJ 07701. Reader Service number 463.

Become a Finance Pro

The PC/Professional Finance Program (PC/PFP II) handles multiple accounts, split and transfer transactions and other complex financial transactions.

It tracks income and expenses in 45 budget categories, each with 26 subcategories. PC/PFP II stores a year's transactions on a single disk and generates a wide range of financial reports. It comes with an illustrated 368-page manual.

PC/PFP II's powerful record-keeping and reporting capabilities are especially useful for tax preparation. Its financial summaries, on which all reports are based, are automatically compiled from individual transactions at the end of every entry session; therefore, tax data is always up-to-date. This makes it possible to forecast end-of-year tax liabilities in time to avert major problems.

To help you take full advantage of its tax-preparation capabilities, the program comes preset with the standard IRS tax-deductible expense categories already in place and ready to use. You can also create your own tax categories.

When PC/PFP II compiles summary financial data from the individual transactions, it also automatically computes your net worth, which lists all of your assets and liabilities. It can also be used to support applications for credit, scholarship aid and other similar requests.

Designed for use on the IBM PC, XT or Compaq (with at least 128K), the PC/PFP II sells for $245 from Best Programs, 5134 Leesburg Pike, Alexandria, VA 22302. Reader Service number 467.



Financing for IBM and Compaq.

VisiWord Plus For IBM, TI Word Processing

VisiWord Plus is an integrated word processing program for personal computers. It's capable of producing letter-perfect memos, correspondence and business-related documents.

The software includes course booklets, called QuickStart, that let you create, revise, save, proof and print documents on your micro. A fully illustrated manual serves as a convenient reference guide and back-up to the QuickStart courses.

VisiWord Plus has a spelling dictionary of more than 100,000 words. You can add terms and names to build a personal dictionary tailored to a particular application or industry. A spelling memory feature in VisiWord Plus remembers your spelling habits and typing habits in order to present the most likely spelling from the program dictionary. Corrections are made with a single keystroke.

In addition, the VisiWord Plus program also extends the value of other VisiCorp software by enabling you to integrate data from existing program files, such as the VisiCalc, VisiFile and VisiSchedule programs, into VisiWord Plus-generated documents.

VisiWord Plus, which retails for $375 from VisiCorp (2895 Zanker Road, San Jose, CA 95134), is available for the IBM PC and XT, the Compaq, the Texas Instruments Personal Computer and all IBM-compatible micros. Reader Service number 466.

Inview of IBM

Graphicon's Inview is a mouse-driven software package. With special windows, Inview provides access to several applications and allows you to exchange data.

A minimum number of windows requires 256K of memory. Additional windowing depends upon the total amount of memory in a given system.

The software takes advantage of the bit-mapped graphics available with the color graphics adapter.

Inview is compatible with 1-2-3, WordStar, dBaseII and Indivisual (Graphicon's line of software) and with almost any packages written for PC DOS 1.1 and 2.0.

Inview is available for the IBM PC with a floppy or hard disk system and a monochrome monitor; it requires 256K. It costs $295 from Graphicon Software, Inc., 399 Sherman Ave., Suite 10, Palo Alto, CA 94306. Reader Service number 469.

Digital's Communication Link

Copylink is a communications package that enables high-speed transfer of text and program codes between dissimilar computers and operating systems.

Copylink provides access to public database services and has Telex and TWX capabilities. It can transfer unattended data and emulate both smart and dumb terminals.

Special features include a

modem with speeds up to 1200 bauds, the ability to receive more than one disk of data and single-keystroke operation of functions such as electronic mailbox access.

Copylink also has sophisticated downloading capabilities as well as other networking features. It offers local data and program transfers between computers using eight-inch and 5¼-inch disk formats. Copylink also supports transfers between MS DOS and CP/M operating systems.

The program has an error-detection code that supports binary file transfer. An advanced CP/M error-recovery technique (with DOS extensions) prevents loss of data by unintentional exit from a program or by disk overflow during file transfers. Errors are signaled by an audible prompt.

Copylink comes with a manual and a free 334-page book—*The Complete Handbook of Personal Computer Communications*.

Copylink costs $99 from U.S. Digital Corp., 5699-D S.E. International Way, Milwaukie, OR 97222. Reader Service number 468.

Number Cruncher

Number Cruncher version 1.1 is a 100 percent integrated system with several new functions, including database management, information management, text editing, applications generation and spreadsheet abilities. You can use these functions without swapping disks or programs in and out of memory.

The data and information management functions let you build electronic files according to your needs. You also have indexing capabilities—Number Cruncher has full alpha and numeric capabilities.

Number Cruncher has a foundation module that provides you with a database management system. With it, you can store customer names and addresses as well as your own defined codes. The foundation module can produce listings based on your codes and can sort these listings in alphabetical or numeric order. The module also has letter-writing capabilities.

Number Cruncher comes with disk demonstration and training sessions, two reference manuals, one training manual, a keyboard template and quick reference flip cards. In addition, complete audio and video training cassettes are available from Pyramid.

Pyramid Data, Ltd. (PO Box 10116, Santa Ana, CA 92711), sells Number Cruncher for $395. It's available for the IBM PC and XT, Compaq, Columbia and DECmate II. Reader Service number 473.

Knoware on IBM

Business professionals who want to learn how to use a personal computer within hours should try Knoware. The program requires no experience or manual, and it comes with an easy-to-read keyboard tutorial and three floppy disks.

Knoware integrates enjoyable learning with program applications. While you are being challenged by the "game" aspects of Knoware, you are also learning six of the most important business applications: simple graphics, Basic programming, database management, spreadsheet applications, text editing and financial decision-making.

Knoware, available for the IBM PC or XT, costs $95 from Knoware, Inc., 301 Vassar St., Cambridge, MA 02139. Reader Service number 471.

Salvo—Software Salvation

Salvo, the first fourth-generation language for personal computers, comes complete with documentation and tutorial. It combines two key features: a true relational database management system that links up to 16 files and a natural language interpreter. Using English language commands, these features let you retrieve and/or manipulate data.

A powerful software tool, Salvo allows you to create programs in a fraction of the time Cobol or Basic or advanced database languages usually require. Advanced features include:

- A knowledge algorithm that allows automatic navigation through the database;
- A command assistant feature that translates syntax-free natural language requests into valid Salvo commands;
- A "Virtual John" capability that creates functions as relational calculus operations, which creates views of joined relations without physically creating result tables.

Salvo, available for eight- and 16-bit micros, sells for $495 from Software Automation, Inc., 14333 Proton Road, Dallas, TX 75234. Reader Service number 472.

Obey the Law, Partner

LawPartner is a sophisticated menu-driven program. It is designed to enhance accuracy and efficiency in law offices with calendaring/docketing, billing and comprehensive management information reports.

LawPartner uses a functioning law office as the model for the program. It consists of three major categories: accounting, management and reporting, and docketing/calendaring.

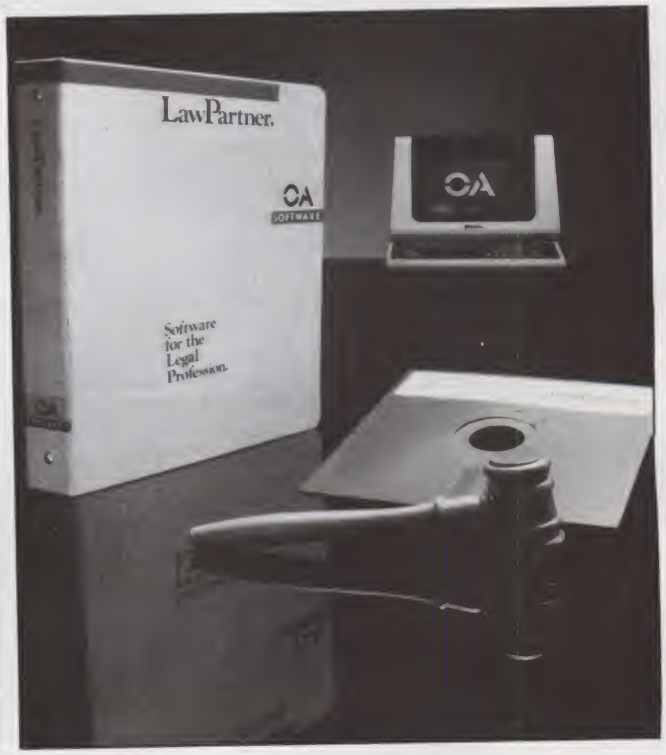
LawPartner utilizes a forward accounting system that allows prompt and efficient billing while providing up-to-the-second information on accounts receivable. It automatically produces computerized statements on business letterheads.

The management reporting feature provides a law firm with clear and meaningful information. It has precise reports that analyze the profitability of the firm and of individuals within the firm.

The docket/calendaring feature is one of the most powerful segments of the package. It provides an attorney with individualized and office-wide reports on such critical information as appointments, special target days, statute of limitations notices and documented filing deadlines.

Access to each portion of LawPartner is protected by six password-activated levels of security.

LawPartner sells for $1495 from OA Software, Inc., 2170 The Alameda, San Jose, CA 95126. It's available for CP/M and MS DOS operating systems. Reader Service number 470.



LawPartner software package is a legal aid.



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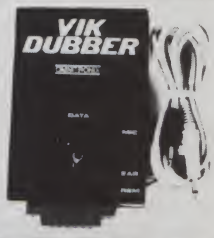
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Edited by Sheila Wright

DTC's 17 Font Printer, Daisy-Wheel Style
The Road Runner Takes the Portable Route
TC1000: A Megabyte of Memory

A Printer with Style

The DTC Style Writer is a daisy-wheel printer for the IBM PC or Apple or TRS-80. It offers 35K of buffered memory that allows the computer to fully load the printer memory within seconds and still accept information while printing. A multicopy feature makes copies without the need to reload the printer buffer memory. An optional 67K expanded buffer is available at $49.

Other features include bi-directional printing, proportional spacing, a Centronics parallel interface, graphics plotting, two-color printing, and programmable pauses for paper, print wheel and ribbon changing.

Seventeen different type fonts are available. The printer uses a cartridge ribbon.

The DTC Style Writer is available from Data Terminals and Communications, 590 Division St., Campbell, CA 95008. It costs $899. Reader Service number 490.

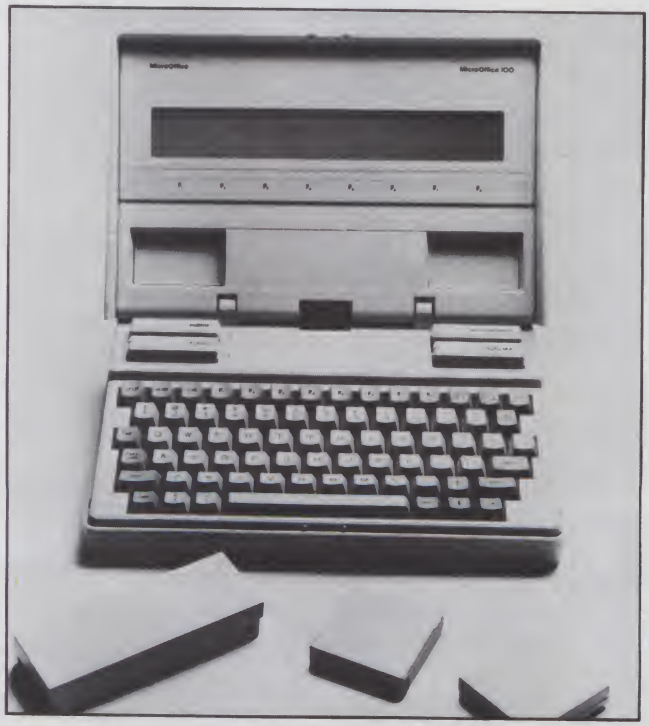


The DTC Style Writer is a new daisy wheel printer from Data Terminals Communications.

Computer RoadRunner

The RoadRunner is a compact portable computer with 64K (RAM and ROM). It can function as both an office communication link and a remote terminal for traveling professionals.

The machine features a CP/M-compatible operating system and communications capability. A cover protects the keyboard and display from damage and, when opened, automatically powers up the unit.



The RoadRunner is a new portable computer from Micro Office Systems Technology, Inc.

The system incorporates a standard-sized, 73-key typewriter-style keyboard that includes: 18 function keys, eight of which are used for single-key menu selection; an eight line by 80 character liquid crystal display that lets you see how information will appear in its final full-width form; and removable, and reusable data and program storage cartridges. One cartridge can store 32K of data and up to 128K of program code.

The main memory power supply of RoadRunner is a removable battery pack that runs for more than eight hours before it needs to be recharged.

RoadRunner is equipped with an RS-232C interface and 300 bps autodial, auto-answer modem.

The RoadRunner is available from Micro Office Systems Technology, Inc., 35 Kings Highway East, Fairfield, CT 06430. It costs $1895. Reader Service number 495.

1M Storage on Microfloppy Disks

Model TC 1000 Drivette is a double-sided microfloppy disk that offers one megabyte of storage capacity on 3¼-inch flexible disks. It is available for all computer systems.

The TC 1000 Drivette is plug- and data-compatible with standard double-sided, 96-track-per-inch, 5¼-inch drives. This compatibility lets you download double-sided, 5¼-inch applications and operating systems software to

the unit's 3¼-inch disks with no modifications.

The model TC 1000 Drivette is available from Tabor Corp., Lyberty Way, Westford, MA 01886. It costs $295. Reader Service number 484.

Print with ShuffleBuffer

ShuffleBuffer is a printing buffer that performs mix-and-merge printout operations. It is an enhanced version of Interactive Structures' Pipeline and is compatible with all microcomputers having a standard serial or parallel port.

ShuffleBuffer has the capability to "shuffle" text, graphics, spreadsheet information and other computer-generated material into any desired combination for printing, plotting or telephone transmission.

Applications include mailing lists, letter mergings, preparation of personalized form letters and other repeated or rearranged material.

The product has two additional modes of operation: the standard "dumb buffer" function of first in/first out (FIFO) printing of material that does not need rearranging or reprinting, and Bypass, to interrupt a long printout in order to produce a separate document on an immediate basis.

ShuffleBuffer has front panel controls that permit stacking. It comes with its own cables, power source and manual. ShuffleBuffer also has a full year warranty.

ShuffleBuffer is available from Interactive Structures, Inc., 146 Montgomery Ave., Bala Cynwyd, PA 19004. It costs $299 with 32K; $349 with 64K; and $445 with 128K. Reader Service number 481.

Retro-Graphics for DEC Terminals

The DQ640-Series Retro-Graphics is a printed circuit card and CRT assemblies that install in DEC terminals. The package provides Tek 4010/4014 graphics features and compatibility with programs written for Digital Engineering's VT640-Series Retro-Graphics for DEC displays. The DQ640-Series is available in 800 × 240 bit resolution.



Perform mix and merge printout operations.



The DQ640-Series Retro-Graphics package includes printed circuit cards and CRT assemblies for DEC terminals from Digital Engineering.



Access 1-2-3 is a complete data communications system from Novation, Inc.

Because it is 4010/4014 based, Retro-Graphics can be used to draw dot/dash/solid vectors, plot points and transmit (x,y) coordinates with a crosshair cursor. Additionally, 800 × 480 bit resolution models can be utilized for displaying all four Tektronix 4014 character sizes.

The DQ640-Series is compatible with both Summagraphics-built digitizers and an optional DE light pen. For graphics presentation, the terminals locally support an array of serial printers, including ones from DEC, HP, Epson and Okidata.

The I/O peripherals interface to Retro-Graphics' enhanced DEC terminals via an optional DE connector assembly. The connector assembly also provides an RS-170 composite video output port for connecting to video-formatted devices.

The DQ640-Series will work on a variety of Tek-based utility and applications programs such as DISSPLA, PLOT10 and Template.

The DQ640 is available from Digital Engineering, 630 Bercut Drive, Sacramento, CA 95814. It costs between $970 and $1195. Reader Service number 483.

Data Communications System

Novation, Inc., has introduced its PC1200B smart modem and packaged it together with Crosstalk XVI from Microstuf, Inc. Called Access 1-2-3, this data communication system is available for the IBM PC or XT, Columbia MPC, Columbia Portable, Corona PC, Corona Portable PC and Compaq.

Engineered to fit in a computer slot, Novation's PC-1200B uses large scale integration technology and features commands and responses that provide telephone line status. It has a built-in dialer (touch-tone or rotary) with dial tone and busy detect, which allows the modem to be programmed to redial. It can also autoanswer

and provide audio monitoring through the computer's internal speaker.

Capable of operating at either 300 or 1200 baud full duplex, the PC1200B can also perform an automatic self-test and receiver alignment at power on. It can also be put into analog or digital loopback test modes.

Crosstalk XVI is an intelligent terminal and file transfer program. It employs all the features of the Novation PC1200B smart modem to accomplish autodial, autologon and autoanswer, and allows for disk-to-disk data transfer.

Since it stores up to 40 separate log-on passwords and IDs, information utilities or mainframes can be reached with a single keystroke. It provides complete control of stop bits, parity, baud rate and duplex while on-line.

Crosstalk's file transfer is performed with extensive error-checking and automatic retransmission. Captured data can be sent to the printer, disk or the buffer. The program displays both available disk space and transmission time for each file at the appropriate bit rate.

Access 1-2-3 is available from Novation, Inc., 20409 Prairie St., Chatsworth, CA 91311. It costs $595. Reader Service number 487.

Sourcebooks for Software/Services

A new two-volume *Small Systems Software and Services Sourcebook* for mini-, micro- and personal computers is now available.

The directory combines over 1000 pages and 3000 listings of applications, systems, databases, word processing, graphics and other software. Both volumes also list complete descriptions, operating systems, hardware, languages, prices, terms, number of installations, training features, documentation, sources, services and more.

The Sourcebook is designed to help you determine whether or not a program is best for your needs. For example, the directory answers such questions as: For whom is the software package or service designed to serve? What equipment will it run on? What is its operating system? What can it be compared to?

If you already have a computer and plan to change to another or if you are about to make your first computer investment, the Sourcebook will help you learn beforehand what kinds and types of software are available for each computer.

The Sourcebook is available from Information Sources, Inc., 1807 Glenview Road, Glenview, IL 60025. It costs $125. Reader Service number 496.

A Smart Modem

Teleport 300 is a new modem that allows you to enter computer data from a remote touch-tone telephone without using a terminal as well as to perform standard computer-to-computer data transmissions.

The modem also provides a sophisticated password security system to prevent unauthorized users from entering the system.

The Teleport 300 is compatible with the Bell 103 protocol and offers standard features such as autoanswer/originate. The new modem is user-programmable and requires no setting of physical switches.

Two modes of operation are possible for the Teleport 300. In the first mode, conventional computer-to-computer data transmissions are possible at terminal data speeds ranging from 75 to 9600 baud.

In the second mode, you can call into the system from any touch-tone telephone, enter a log-on password using push-button code and then enter data into the computer system using the Teleport 300's DTMF-to-ASCII conversion capability.

Teleport 300 is available from Teltone, 10801 120th N.E., Kirkland, WA 98033. It costs $349. Reader Service number 492.

Joy-Mouse for TRS-80

Joy-Mouse A/D Interface for the TRS-80 Model III and 4 is a hardware device that allows two joysticks, trackballs and/or mouse controls to be connected to your computer.

The hardware provides instantaneous high-resolution x and y position values ranging from 0–255. It also has sound and music features. The cassette cable plugs into the built-in audio amplifier,



Teletone's Teleport 300 modem provides touch-tone telephone data entry.



A new two-volume Small Systems Software and Services Sourcebook *for mini-, micro- and personal computers is now available from Information Sources, Inc.*

which features a proportional volume control with on/off switch.

Joy-Mouse can be used with either Basic or assembly language programs. It also works with all game programs written for joysticks. The first mode returns the exact joystick position while the second returns eight possible directions.

Joy-Mouse lets you use any device that is designed to be plugged into the TRS-80 Color Computer joystick port with the Model III and 4 computers. Four analog-to-digital ports are available for monitoring analog signals such as temperature, wind speed, light intensity and voltages.

Joy-Mouse comes with its own power supply and connects to the TRS-80 I/O expansion port. The I/O bus is extended so that other peripherals may be connected at the same time.

Joy-Mouse is available from Micro-Labs, Inc., 902 Pinecrest, Richard, TX 75080. It costs $99.95. Reader Service number 493.

New Single-Board Computer

Microtrainer 2 is a new single-board computer designed to teach the theory of digital electronics, microprocessors and interfacing.

Based on the Motorola 6802 microprocessor, it contains a 2K monitor in ROM, 1K RAM and memory expansion for an extra 2K RAM or ROM. Programs are entered using the 25-key keypad with 16 hexadecimal keys and nine function keys. Data is displayed with eight seven-segment LED digit displays.

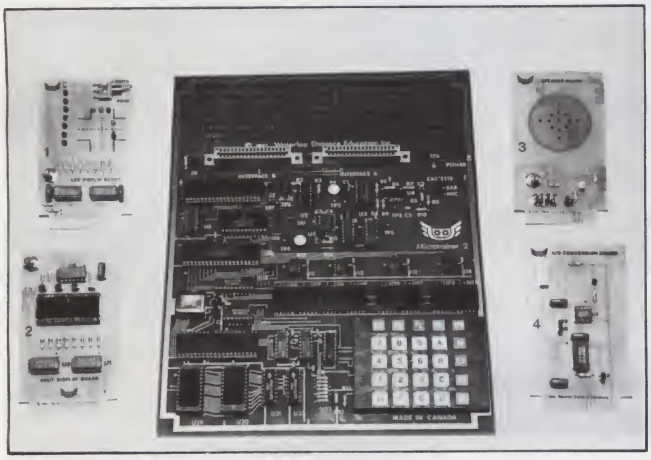
A built-in cassette interface allows you to store and load programs from audio cassettes. Two 18-pin edge-connector sockets are provided for connection to the outside world. A 6821 PIA connected to these sockets is available to the user.

A prototyping area at the top of the board can be attached to the 6850 serial chip (normally used by the cassette circuit) to provide serial interfaces on the prototyping area.

A complete instruction manual with basic instructions and a complete circuit diagram and listing of the monitor ROM is included. The Microtrainer 2 replaces the Microtrainer 1, a Motorola MEK6802D3 computer connected to an expansion board containing a cassette interface and two parallel ports.

A set of I/O modules especially designed for teaching purposes is also available. These include a Digit Display Board; an LED board with eight LEDs for monitoring a parallel port, a speaker board and an A/D conversion board. An EPROM programmer and E^2PROM eraser/programmer module will be available soon.

The Microtrainer 2 is available from Waterloo Distance Education, Inc., PO Box 62, Waterloo, Ontario, Canada. It costs $295. Reader Service number 485.



Waterloo Distance Education's Microtrainer 2 with four plug-in experiment modules.

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Graphmate II Portability

Graphmate II is a portable graphics plotter that utilizes an alphanumeric keyboard and single-line display. It offers graphics with 50 mm resolution.

Special features include automatic pen selection (for four colors), automatic pen capping and the ceramic-tipped or oil-based felt-tip pens. The unit can also be used as a printer and the graphics ROM contains commands that let you plot bar graphs, line segments and pie charts.

With a battery backup for memory (standard), the plotter can have both the type of graph and its data entered and transported to another location for drawing graphs.

An optional micro-disk unit ($985) allows storage of both data and graphs for reviewing at a later date.

Graphmate II is available from Yokogawa Corp. of America, 2 Dart Road, Shenandoah, GA 30265. It costs $2950. Reader Service number 480.

Epson Dot Matrix Printer

The Epson RX-80 F/T is a dot matrix printer that gives you dot addressable graphics, a standard centronics compatible interface with a wide range of interfaces to suit most machines and a fast, 100 characters-per-second print speed.

It offers you a choice of two full 96-character ASCII sets in addition to nine international character sets and 32 HX-20 graphics characters. You may choose from 128 type styles, including emphasized, doublestrike, elite and italics.

The RX-80 F/T incorporates both friction and tractor feed (which allows for variable paper width). Other standard features include a disposable printhead, which can easily be removed or replaced; logic seeking, bidirectional printing; an underline mode; and a special Quiet mode that reduces the noise level for use at home or office.

The Epson RX-80 F/T is available from Epson America, Inc., 3415 Kashima St., Torrance, CA 90505. It costs $599. Reader Service number 488.

Apple Serial Card

The Apple Serial Card III is a serial communications device for Apple III computers.

By inserting the card in one of the Apple III's internal slots, you can communicate with a variety of modems, plotters, printers and other serial (RS-232C) communication devices without disconnecting or reattaching any of the system's cables. Up to four cards can be used simultaneously to fit your communications requirements.

With appropriate software, the card enables professionals and small businesses to perform multiple communications tasks, such as printing documents while communicating with another computer using a modem.

An accessible switch on the card permits changing from DTE to DCE formats without having to replace the modem eliminator cable.

If you require only one serial communications device, it can be connected directly to the built-in serial port on the Apple III's back panel.

Apple Serial Card III is available from Apple Computer, 10260 Bandley Drive, Cupertino, CA. It costs $225. Reader Service number 494.

Interface from Apple To Color Video Monitors

The Rainbo-256 is a high-resolution analog RGB interface card designed to interface Apple II Plus and IIe computers to Electrohome, Taxan and other similar color monitors.

The Rainbo-256 is said to eliminate smearing problems inherent in the video circuits of the Apple, Franklin or other look-a-likes.

The Rainbo-256 is also programmable. Instead of being limited to the computer's color capabilities, the Rainbo-256 may be programmed for 256 individual colors by addressing 16 additional memory locations that the Rainbo-256 adds to the Apple.

The Rainbo-256 is available from Microtek, Inc., 4750 Viewridge Ave., San Diego, CA 92123. It costs $279. Reader Service number 489.

IBM Adapter

MasterGraphics 1 Adapter is a single-module replacement for such IBM adapters as the monochrome display and parallel printer adapter, the color/graphics monitor adapter and the parallel printer adapter.

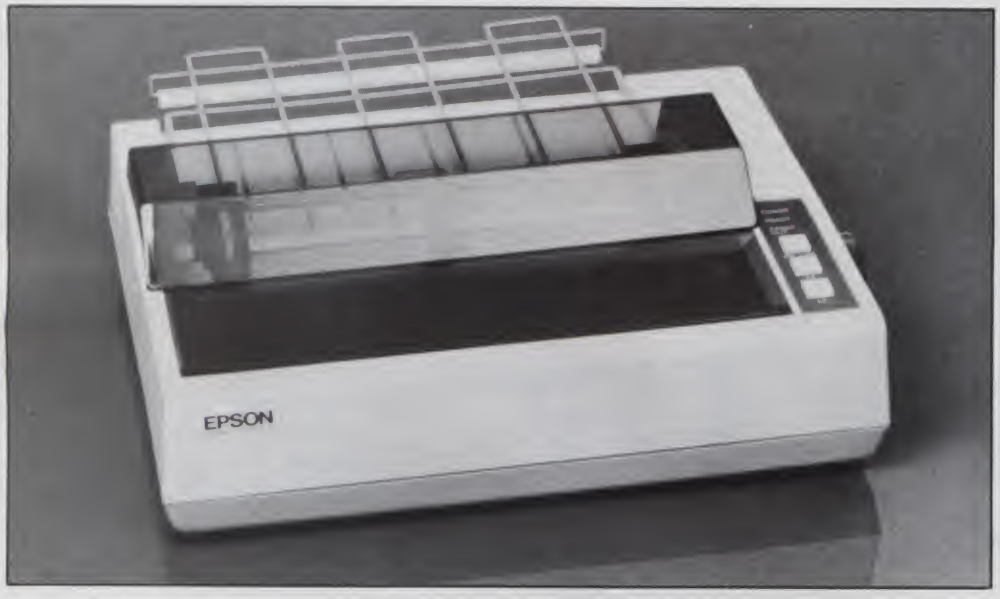
The MasterGraphics 1 Adapter provides both hardware interrupt logic and two display buffers for color animation in a medium resolution (320 × 200 16-color) graphics mode.

The interrupt logic increases animation speed from the five to seven screens per second permitted by IBM adapters to 30–60 screens per second.

In addition to smoothing animation, the MasterGraphics 1 Adapter eases the mixing of text and graphics by offering CPU access to the character generator. The CPU can read the character pattern from the character generator and place a text character anywhere on the screen using graphics commands.

The MasterGraphics 1 Adapter also quadruples the display storage provided by IBM adapters from 16K to 64K, increases active colors from four to 16 and allows 640 × 200 16-color resolution and 768 × 340 monochrome resolution.

MasterGraphics 1 Adapter is available from MicroGraphics Technology Corp., 1820 McCarthy Blvd., Milpitas, CA 95035. It costs $579. Reader Service number 482.



The RX-80 F/T is a new dot matrix printer from Epson America, Inc.

Deadline Extended! Win $500 Worth of Prizes!!

Now is your chance to cash in on your robotics programming skill and creativity. Enter the first Microcomputing/Heath Company HERO 1 programming contest and win up to $500 worth of prizes. Microcomputing magazine, in conjunction with the Heath Company, manufacturers of the HERO 1, invites all HERO 1 programmers to submit their best applications to this contest. Entries will be judged in the following categories:

1. Standard HERO 1 with arm.

2. Modified HERO 1, including additional RAM or ROM, as well as any mechanical or electrical modifications.



Prizes will be awarded to the top three entrants in *each* category. Two $500 gift certificates (one from each category) will be awarded. Each first place winner will select the prizes of his choice, worth up to $500, from the latest Heath Company catalog. A $100 gift certificate, good toward any purchase from the Heath catalog, will be awarded to both second place winners. Third place winners from each category will receive a copy of Microcomputing columnist Mark Robillard's new book, "HERO 1 Advanced Programming and Interfacing," plus a one-year paid subscription to Microcomputing magazine.

CONTEST RULES

1. All programs must be submitted both on cassette tape and in hard copy form. A brief, written description of the application must accompany each entry.
2. Entries in the modified category must include a complete description of the alterations performed on the robot.
3. The contest is open to all HERO 1 owners, except employees of Wayne Green Inc. (publisher of Microcomputing), and the Heath Company and and their immediate families.
4. All entries, including programs, become the property of Microcomputing.
5. All entries must be received by Microcomputing by March 1, 1984.

Send submissions to:

Robotics Contest
Microcomputing
80 Pine Street
Peterborough, N.H. 03458

7. Contestants may submit more than one entry in one or both categories.

Entries will be judged on originality and technical feasibility. The more practical and easily adaptable the application, the better. Winners will be announced in the June 1984 issue of Microcomputing. So rev up your robot, and let's put the Heath's HERO through its paces!

MICROCOMPUTING®

80 PINE STREET PETERBOROUGH, NH 03458

REVIEWS

(From p. 146)

Budget.DIF. I then loaded this into pfs: Graph and plotted it as a pie chart, Fig. 1. The percent calculations are automatically performed by the program. The whole process is straightforward and a pleasure to work with. Pie charts are limited to eight sections.

Fig. 2 illustrates a combination of four sets of data on one chart consisting of line and bar graphs. The individual sets of numbers are shown in Table 1, which was printed out by the pfs:Graph program. Fig. 3 illustrates a stacked bar graph consisting of four different items.

The data and graphs may be saved on standard DOS 3.3 formatted disks. You can save approximately 45 graphs on one disk. Pie charts look elliptical on my monitor, but are printed as circles. Although the plots for this article were printed with an Epson FX-80 printer, all the Epson printers are supported. In addition, there are printer drivers for the IDS Prism, Okidata 82A, Apple Dot Matrix, C.Itoh and the Apple Silentype. Printers not listed here can be accessed if you have a Grappler interface card that uses your particular machine.

You can also plot your graph in blushing color with the Hewlett-Packard 7470A graphics plotter (option 001 only). Your printer card must be in slot 1 and the Hewlett-Packard plotter must be connected to slot 2.

To sum up, this is a simple program that performs well within its limitations. The control C key command is used most frequently, but I would have preferred the open- or closed-Apple key on the IIe instead. Limiting attachments like a printer or plotter to a specific slot can also be a problem.

Jerry Brieger
Redmond, WA

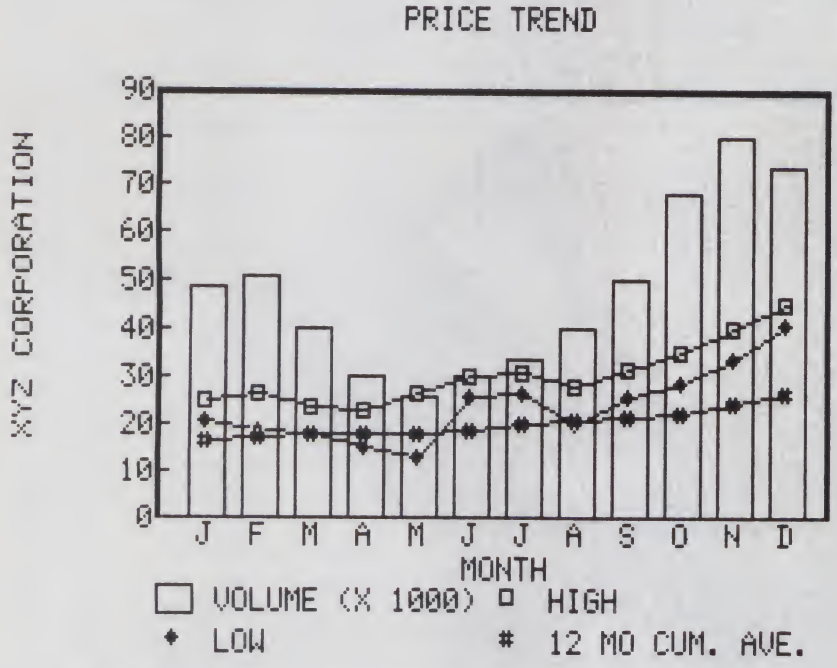


Fig. 2. A combination line/bar graph combining four sets of data.

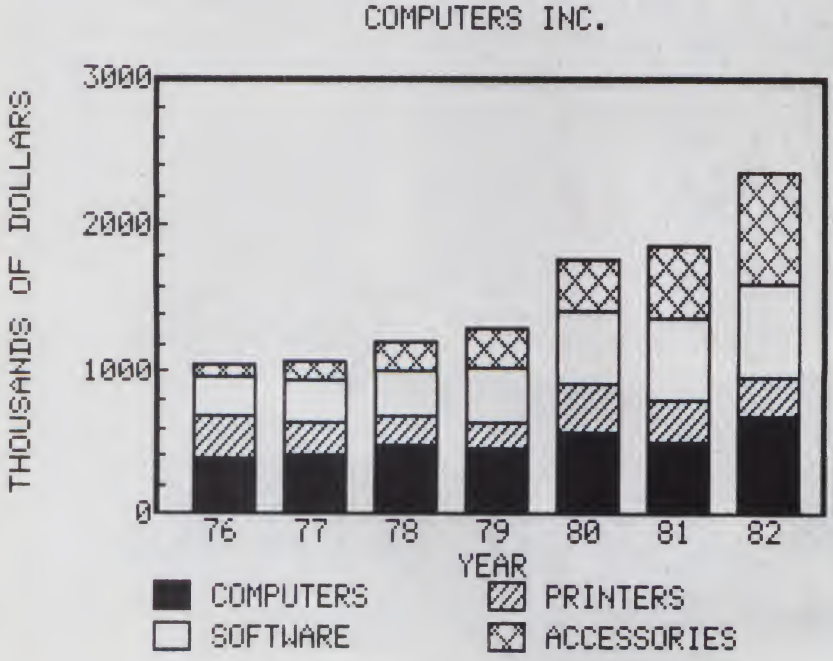


Fig. 3. A pfs:Graph-generated stacked bar graph.

VisiCalc IV

System Requirements: IBM PC or IBM XT with at least 64K.
Manufacturer: Personal Software, 0895 Zanker Road, San Jose, CA 95134.
Price: $250.

VisiCalc IV consists of two software products: VisiCalc and StretchCalc.

VisiCalc IV comes with documentation for VisiCalc and StretchCalc and a disk for each program.

Since VisiCalc has already been reviewed in *Microcomputing*, I'll discuss StretchCalc and its new enhancements. StretchCalc alone costs $99.95 and offers three key features:

- It creates defined function keys of your choice.
- It sorts rows in spreadsheets.
- It quickly graphs information directly from your spreadsheet.

StretchCalc puts an end to the long process of sorting spreadsheet rows and saves you the burden of buying additional

	High	Low	Volume (x 1000)	12 Mo Cum. Avg.
1	25	21	49	16.80
2	27	19	51	17.60
3	24	18	40	18
4	23	15	30	18.40
5	27	13	26	18.50
6	30	26	30	19.20
7	31	27	34	20.50
8	28	20	40	20.80
9	32	26	50	21.60
10	35	29	68	22.60
11	40	34	80	24.70
12	45	41	74	26.80

Table 1. Numbers for Fig. 2, printed out by a pfs:Graph program.

subroutines. With StretchCalc you simply select which row to sort and the sort will be complete in just a few seconds. If you must repeat a long sequence of commands, StretchCalc lets you define up to 80 keystrokes with a function key or letter.

StretchCalc's documentation is well-organized. Each command has a full explanation and many examples. Flow charts for the command tree let you quickly find the option you're looking for.

I used a dot matrix copy for reviewing StretchCalc and found some of the pages were light. I assume that this is one of the first printings and that future editions will be easier to read.

These new enhancements will give you some assurances that VisiCalc will not be left behind in the Calc wars that pervade the microcomputer industry. Now, if they would only integrate variable column widths . . .

Keith Thompson
***Microcomputing* Staff**

BPS Business Graphics Package

System Requirements: IBM PC; 128K; two disk drives (single-sided for screen, double-sided for printer and plotter drivers); color graphics adapter and monitor; asynchronous communications adapter.
Manufacturer: Business & Professional Software, Inc., 143 Binney St., Cambridge, MA 02142.
Price: $350.

If nothing were right about BPS Business Graphics Package, the superb documentation would more than compensate for its shortcomings. The instructions and tutorial simplify complex concepts and thoroughly teach the use of the package. The package, like the software it describes, is thoroughly *professional.*

The BPS Business Graphics package can prepare all graph forms (pies, bars, lines, points, areas and any combination thereof). The graphs are available in 16 colors for output (including more than 40 printers and plotters). Graphs use data directly entered from SuperCalc, VisiCalc files or similar source files with the direct command simplicity inherent in a Basic program. Because BPS recognizes that data can come from foreign sources, the package can also extract data from word processing files.

The BPS package offers you graph development concepts that use an interpretive compiler approach to the specifications developed on-screen. Bit by bit, the visual develops and can be modified with simple commands until it's correct.

You can specify titles and legends and select the colors used for lines, graphs, bars, wedges, fill and legends. In essence, a graphics formula is developed and then filed.

When needed, the description of the graph is recalled into the program along with filed data. It is used to prepare one of the many kinds of plots and presentations of that data.

The package also lets you connect visuals in a computerized slide show, print them in black and white on a graphics printer, print them in color on a color graphics printer and plot them using a plethora of inexpensive plotters.

The software and support package will have you developing worthwhile visuals after reading only a few pages of the tutorial. The self-running demonstration that accompanies the package may be viewed in less than ten minutes. The tutorial manual is easy to read and extremely well-illustrated.

Here's a short example to prove how easy BPS is to use. This graphics program is designed to draw six horizontal bars on a graph that identifies the number of bicycle owners (male and female) who purchase a bicycle for one of three reasons: weight, speed or miscellaneous.

If nothing were right about BPS, the superb documentation would more than compensate for its shortcomings.

First, the data has been typed and saved in separate files, known as Male and Female. The format of the files is as follows:

MALE

PERCENT	REASON FOR PURCHASE
20	WEIGHT
62	SPEED
18	MISC

FEMALE

PERCENT	REASON FOR PURCHASE
56	WEIGHT
20	SPEED
24	MISC

That data can be plotted with this pfs: Graph program, which may be either typed or read from a description file:

```
LOAD MALE
SET HORIZONTAL TITLE "PERCENT"
SET VERTICAL TITLE "PURCHASE
REASON"
SET HORIZONTAL RANGE 0 100
SET FILL ON
DRAW HORIZONTAL BAR 2
LOAD POINTS FEMALE
SET FILL OFF
DRAW HORIZONTAL BAR
SET FLOATING TITLE "MALE"
SET FLOATING TITLE "FEMALE"
SET TITLE "BICYCLE SURVEY"
```

The end product is a chart with three horizontal bar pairs (weight, speed, miscellaneous), with the pair identified by a title "floated" to the end of the middle set, a horizontal (x axis) scale graduated 0–100 identified as Percent and a vertical scale identified as Purchase Reason. The entire chart is titled Bicycle Survey.

The system's commands are easy to learn. Drawing is as simple as saying Draw. To turn features (such as fill or color) on or off, use the Set command. Editing is easy, as is file handling. This package lets you use the VisiCalc printer output as input. In fact, you can use any print file as input.

In addition to eight List commands, 17 Set commands, five Clear commands and nine Draw commands, there are commands for disk and file handling, data editing, curve definitions, business functions and math functions. In short, if a command doesn't exist in this package, you don't need it. If you run into trouble, there are help screens throughout the package to instruct you and to correct any misunderstandings.

The tutorial takes a couple of hours to learn and will lead you directly into the reference manual. By the time you arrive there, you'll be more than familiar with the package and you'll be able to put it to good use. The documentation and tutorial include nine easy-to-digest chapters, plus appendixes. While the reference manual is useful for fine points, you'll find that the pocket reference card, with occasional reference to the wall chart, will be more than sufficient.

BPS is best-suited for a business or a school system, both of which can make extensive use of its capabilities.

Kenniston Lord
Winchendon, MA

Bottom Line Strategist

System Requirements: TRS-80 Model II with 64K and a CP/M card or Apple II with 64K and a CP/M card or IBM PC with 128K.
Manufacturer: Ashton-Tate, 9929 W. Jefferson Blvd., Culver City, CA.
Price: $400.

Ashton-Tate is best known for dBaseII. In conjunction with World Information and Technology Systems Corp., it now brings you a cleverly constructed, easy-to-use econometric modeling tool: the Bottom Line Strategist, version 1.10. Knowledge of economic or financial theories is not required to benefit from this program.

To run Bottom Line Strategist (BLS), two disk drives are helpful, but not essential. The system's many hard-copy options require a 120-column printer with

continuous feed capability. If you use a Centronics interface, enable the extra line feed suppression or all printouts will be double-spaced.

Most BLS features can be sampled from a canned scenario on the demonstration disk. If you aren't convinced of the usefulness of the model, take advantage of the money-back guarantee by returning your unopened distribution disk to Ashton-Tate within 30 days.

BLS is completely menu-driven. There's even a menu choice that lets you read your registration agreement. (Slight overkill?)

Two other main menu selections display the flow chart for BLS and furnish a good tutorial overview for use of the model.

The system is well-designed. Prompts are easy to understand and buzzword-free. Menus, program result screens, help information and error messages are clearly and attractively presented.

The guts of the program involve typing your "key business assumptions" for creation of the model. Chapter 3 of the manual and two demonstration problems aid you in developing model parameters. You can speed your work with BLS by quickly accessing help screens for the various prompts rather than flipping through the manual for any explanations you need.

Business growth is assumed to follow an exponential logistic curve based on your responses for timing and volume of initial and maximum sales. You may factor in marketing and advertising policy, entering assumed customer response to advertising expenditures, or you may run the model without it.

Since the heart of the program comprises interaction of the data you supply with a form of break-even analysis, you have a considerable amount of flexibility when entering start-up, fixed and variable costs, choosing pricing methods, and determining timing for the production and sales cycles. Effects of inflation on costs and revenues may be adjusted separately.

If you deem it necessary for your business, labor cost savings resulting from experience can be simulated with a learning curve. Tax impact is considered by utilizing either no depreciation, straight line declining balance, sum of the year's digits or the new Accelerated Cost Recovery System for either personal property or real property as depreciation methods for fixed assets affected by your tax rate. When you determine the cost of capital, the tax deductibility of interest costs can be taken into account.

The Fun Starts

Once you have entered the data, the fun begins. Selecting Forecasting from the main menu produces a series of tables on the screen: Sales and Marketing Analysis; Profitability; and Depreciation and Tax Shelter. It also produces a summary of your assumptions and cash flow and break-even information.

You can pause the display at any point. Hard copy is available as well. If you enter data that is "inconsistent or illegal," the latter term referring to program limitations, warning screens alert you, specifically listing your bad responses.

When the problem is not self-evident, the related help screen usually furnishes sufficient information for a proper revision of the data. You must be familiar with the limitations and requirements for the depreciation method you use in order to understand the nature of an erroneous input for depreciation, since details of this kind are not supplied.

The inflation factor is figured into the net present value calculation, but revenues and costs are not adjusted in either the tables or the graphs. This is the major drawback to BLS. (If you have dBase II, you can develop all of these figures in reports structured to your specifications then transfer them to BLS.)

> The beauty of this program rests in the ease and rapidity with which you can change assumptions.

In presenting a complete package to obtain financing, for example, figures are generally expected to be in future year dollars after inflation, rather than current year dollars. For example, payments on a long-term loan may remain constant, but revenues presumably will be affected by inflation with payback in inflated dollars.

Assuming this capability is added to BLS, the greatest flexibility would be to give you the option of adjusting sales and revenue projections. If I were limited to a single format, figures and graphics adjusted for inflation would be preferable to unadjusted figures.

BLS graphics facilities are outstanding. Not only can you graph any of the 11 financial plan components simply by selecting choices from menus, but you can easily expand any section of a graph on either the x or y axis and print either the original or blown-up portion with the zoom feature. Expansions can be repeated to some extent and are autoscaled. Separate help screens aid in interpreting the different graphs.

Another graphics feature is alternative graphing of monthly or cumulative amounts, month-to-month changes or month-to-month percentage changes directly from the graphics menu, all from the original data.

On-screen bar graphs are more dramatic than the printouts, which use asterisks to delineate individual points on the curves equivalent to the bar limits. If you have an Epson MX-80 with the Graftrax option, an MX-82 or MX-100, your printed graphs will reproduce the screen display with solid bars.

Quick and Easy

The beauty of this program rests in the ease and rapidity with which you can change assumptions regarding major business decisions and obtain detailed financial printouts, a host of graphical analysis visualizations, or both. You don't need to know or enter any formulas.

A range of proposed business scenarios can be generated quickly; this isolates the effects of altering any one or more of the major variables.

The last set of data for a model is automatically saved when you exit BLS. Unfortunately, the mechanism for saving model data requires exiting BLS to set up the file into which your new assumptions will be placed when you save each different group of model parameters.

The interface between BLS and dBaseII, alluded to above, is a new function added in version 1.10. Simply running the conversion program included in the software creates a database in dBaseII format immediately available for use with all of the manipulative power of dBaseII. Interplay between BLS models and the analytical abilities of dBaseII is limited only by your imagination and understanding of the data and the capabilities of the two programs. Sales, costs or any other figures can be selected from BLS-converted files and compared or adjusted with historical information in other databases or with arbitrary factors. BLS lets you rapidly create a database to support your model, and dBaseII lets you dissect, expand or intertwine the data in the most advantageous manner.

What makes BLS particularly valuable is the tutorial information contained in the manual. There is a wealth of explanation for pragmatic applications of the program. Complete with a detailed table of contents and an index, the documentation comes in a quality three-ring binder, nicely tabbed, printed with wide margins and containing numerous charts and sample screens.

Creating and using data files with BLS deserves clarification. After an overview, the first chapter discusses the control keys used by the software. Chapter 2 contains examples of analysis for two different types of businesses and a tour through the graphics package.

Practical application of BLS mandates a careful reading of Chapter 3, which gets

down to the nitty-gritty of determining essential model inputs for real-life situations for your own business or a projected new project. Each major segment of the program is analyzed with helpful discussions of both financial and graphics results. Additional economic theory related to BLS is included in the fourth chapter of the manual.

Chapter 5, which covers BLS and dBaseII interaction, was in preliminary draft form and undoubtedly will be improved. Additional explanatory material is needed, particularly with regard to the more sophisticated report forms included for demonstration purposes.

You'll find the final complex illustrations difficult to understand if you aren't reasonably familiar with dBaseII operation and the general type of financial planning techniques involved. Nevertheless, the initial presentation is coherent and logical, utilizing one of the pro-forma sample files as an example of the operation of the conversion from BLS to dBaseII.

Appendix A contains a marginally useful glossary, but appendixes B and C provide vital information for advanced users. Basic calculus formulas are given for the different essential aspects of the econometric model in Appendix B, along with the helpful explanations.

Appendix C is a bibliography of source and reference material. I located many of the texts in the UCLA library. (In particular, I recommend that you survey the Reinhardt article dealing with the Lockheed Tri Star for a better understanding of BLS and the application of an econometric analysis to practical business planning. If you are not familiar with break-even analysis, The Treasurer's Handbook will enlighten you. Other references contain more generalized theoretical dissertations.)

Included on the BLS distribution disk is an installation program. If your terminal is among the 31 popular types listed, just identify it by number and enter the drive on which BLS is located. Otherwise, you must enter descriptive information regarding control sequences for operation of your terminal. A help screen explains what is needed for the novice computerist.

Printer selection offers options for the Epson printers mentioned above, or for other standard printers.

BLS is not copy-protected. Within its limits, the software is quite flexible, but it cannot be modified, because the program code is compiled Fortran.

Registered users receive corrections, updates and technical support. The hotline number is 213-558-0086.

My queries regarding technical matters from initial exposure to BLS were answered promptly. Questions about economic aspects of program applications took a couple of days, but Ashton-Tate did follow through with the information.

Both the demonstration and distribution copies of BLS changed the cursor from a solid block to an underline. Lo and behold, it didn't change back after exiting from BLS! I had to reset the computer to regain the block cursor. Ashton-Tate states they will cure this bug in future versions.

Almost all inputs can be selectively bypassed to simplify your model, except for the growth curve. You are limited to an exponential curve, the S-shaped logistics curve. Considerable shaping of the curve can be accomplished by your choice of maximum growth point, time horizons for the entire model, time required to reach the 50 percent growth point and your entry for market saturation.

A steady state is simulated by setting initial sales at maximum. This enables you to model an income stream from an asset such as an apartment building, which can be adjusted for inflation. Unfortunately, the inflation adjustment does not show up in the calculations and graphs of revenues and costs, but only in net present value computations as mentioned above.

You can produce a complete package of information for a variety of business plans, including the graphics material. For each permutation or combination of essential factors, you can determine when cash flow becomes positive, when overall break-even is reached and the effect of different alternatives on the net worth of your company.

We need more programs like this . . .

A Welcome Package

The Bottom Line Strategist is a fine addition to software for practical business planning with microcomputers. Creation of ready-to-run dBaseII files offers many interesting possibilities.

We need more programs like this because they model common business scenarios and aid managers in using sophisticated and scientific approaches to planning.

There are tradeoffs between model complexity, number of inputs, details required for inputs, flexibility in changing scenario parameters and purported accuracy or usefulness of predictions based on the model results. The Bottom Line Strategist does an excellent job in balancing these factors to produce a worthwhile, understandable and easy-to-use econometric model with excellent graphics facilities.

Charles Perelman
Los Angeles, CA

Look For

jr

For IBM's Home Computer

The new system-specific magazine for the IBM PC jr. The premiere issue is on its way!

From The Wayne Green Publications Group

Infotory

System Requirements: IBM PC with minimum 64K RAM, or IBM Video monitor, or IBM 80 cps Matrix Printer; minimum of two disk drives.
Manufacturer: SSR Corp., 1600 Lyell Ave., Rochester, NY 14606.
Price: $39.95

Infotory is a good, easy-to-use inventory program. If you can accept the average cost method for pricing your inventory and you don't need to keep goods in process in your inventory, Infotory will meet the needs for a nonintegrated inventory system. The reporting facilities available and ease of use make this an inventory system that is hard to pass up.

Why a Separate Inventory System?

A clerk in a stationery store had just sold a $25 slide rule to an anxious young student. Noticing that there were no more slide rules in stock, she ordered another dozen. Later that week, the student's parents returned the slide rule with the explanation that no one uses them in this computer age. The stationery store was now stuck with 13 slide rules. If the clerk had known that one slide rule had been sold in four years, she wouldn't have reordered more.

Accurate inventory information is just one element a business needs to provide information to manage and record business activities. In theory, inventory should be part of an integrated accounting system where the purchase or sale of an item in inventory updates the accounts receivables, accounts payable, general ledger, income statement and inventory.

The Infotory inventory management system by SSR Corp., is intended to provide a separate inventory system that enhances existing accounting systems.

Documentation

When contemplating the purchase of a system, you should first evaluate the documentation.

The instructions on Infotory are clear and crisp. They are written so well that I was able to start up the program immediately without a hitch.

A review of the documentation against my criteria for an inventory system reveals several factors. The Infotory system tracks and records goods that are available for sale. The system is probably not applicable for inventory control of a manufacturing firm because there are no procedures for a goods-in-process inventory. Note that if all a manufacturing operation wanted to do was keep track of its raw materials inventory (those goods used to manufacture the finished product), the Infotory system would work fine.

The information on record for each item meets the demands for inventory.

The Infotory system has several unique features. A category code determines how many items are available. For example, not only is it possible to keep track of more than 200 pencils, but you can get a report on pencils as a category.

A "Per" field provides you with input capabilities. It lets you sell by the unit and by the piece. It also calculates the correct purchase cost in order to keep track of the balance of the package.

Reorder flags are provided to determine when it is time to reorder an item. Data fields kept on the inventory record include average cost, price per unit of measure, vendor code location of item and reorder level.

Processing of orders and sales automatically maintains the month-to-date cost, quantity sold, sales, receiving cost, quantity-on-hand and average cost. It also keeps track of the margin and the year-to-date average price, profit and percent of gross profit on sales.

The Infotory system meets or surpasses all of my requirements for a "stand alone" inventory system, except for pricing of the inventory. The only inventory pricing method available is average cost. For most businesses and the IRS, average cost is acceptable. However, the ability to recognize the cost of the goods sold as the cost of the latest purchase (Lifo), or the earliest purchase price (Fifo), could affect the book and tax profitability of many firms. This is a definite weakness.

Before leaving the review of the documentation and going into the actual operation of the system, the most unique feature of the Infotory system is a subsystem called Anyreport. Although there is a variety of reports available with the system, Anyreport is a screen-driven feature that allows the user to select virtually any report from the data.

The documentation for this feature is excellent and, combined with the screens which are used for generating the report, almost anyone can use Anyreport. Formats for frequently used reports can be saved. The Anyreport feature provides the inventory and sales report with features that encourage the purchase and use of the system.

The Infotory System

Following the instructions in the manual, there was absolutely no problem in bringing up the system. One nuisance is that the disk provided is only single sided. This is a waste of one disk side of my system. However, since the system is designed for single-sided disk drives or double-sided drives, the reason for a single-sided disk is obvious.

The documentation stated that Infotory could contain 2600 items in a two-drive double-sided double-density system. That is a lot of items. However, being energetic, I made the effort to test the capacity.

After you fill up one disk drive, the second can be used; however, not all the Infotory system programs are resident in RAM, thus pauses occur while the system tells the user to reinsert the system disk. As a possible method around this inconvenience, an internal RAM drive was set up in memory and the program disk copied into the internal RAM. This works well.

The Infotory program was also tested using a Tall Grass 20M hard disk in the "B" drive slot. This procedure worked even though I was not using the hard disk version of the Infotory system. This should provide more than enough room for any person.

The speed of the Infotory system is adequate. Speed limitations during entry of transactions are usually due to the skill of the person doing the entry rather than the system itself. This is especially true using the hard disk environment. Using floppies, search and retrieval has the usual limitations on speed.

Use of the System

To evaluate the system, I sought the assistance of a data processing innocent. It became quickly obvious that the manual was well-written. Its screen design is excellent and all of the transactions are easy to use.

Several aids assure you of accuracy when using this program. Each screen requests sight verification prior to the final entry. Prompts reduce possible data losses or accidental over-writing of data. The screens are easy to understand and are used without reference to the documentation.

The manual is excellent. Its only defect is the absence of an index which makes looking up instructions a difficult process. The manual is organized on a functional basis, thus, absence of an index isn't critical. All you have to do is look for the instructions under the function that is being worked on.

Without help, the innocent operator can learn and use the system for all transactions. Putting more than 1500 inventory items on the system took me about 27 hours to do over a six-day period. This should help you when deciding whether or not to purchase the system. This manual actually gives you conversion instructions to help you get started.

I asked the data processing innocent to write reports using the Anyreport feature. He had no problem with it, but it did take about ten minutes for the report to run on full file.

In general, this data processing innocent's opinion is that the Infotory system is an excellent first experience!

Harold Frohlich
Holliston, MA

CLIP Version 2.0

System Requirements: any 8-bit CP/M system.
Manufacturer: Thoughtware, Inc., PO Box 41436, Tuscon, AZ 85717.
Price: $49.95.

Command Line Interpretive Program, (CLIP) Version 2.0 is a set of enhancements with some of the capabilities of larger and more advanced operating systems.

CLIP runs as a program under CP/M. However, it intercepts and interprets command lines as well as invokes the appropriate CP/M facilities.

Once CLIP is running, you can enter commands and CLIP will run them as usual. It presents you with the illusion that you are running under the most powerful CP/M you have ever used.

The basic package, containing the enhancements themselves, costs $49.95. For $25 more you can buy a set of software tools which greatly increases the power and flexibility of CLIP. And with another $25 you can buy a file encryption program.

CLIP is contained in a file, CLIP.COM, and is supplemented by an overlay file named CLIP.OVL. These files must be on a properly SYSGENed disk mounted on Drive A. To run CLIP, you simply type

```
A>CLIP
```

The .COM file is loaded and CLIP takes over, announcing and reminding you of its presence by another prompt.

In this review, I'll identify CP/M commands by using the CP/M prompt and CLIP commands by using the CLIP prompt. To run programs under CLIP you simply enter commands in the usual way; the difference is that you now have a much larger and more flexible set of commands available to you than you would have under CP/M alone. You can still run programs of your own, and they can take advantage of the increased power of CLIP, as I'll explain.

To exit CLIP and return to CP/M (which you would ordinarily do only at the end of a session), type

```
A) BYE
```

CLIP cleans things up, bids you farewell and returns you to CP/M.

Macros

In my opinion, there are three important enhancements provided by CLIP.

- A highly developed, complex command language that permits you to use it as a programming language for scheduling and sequencing jobs run by the computer.
- The ability to select a program's input and output devices from the command line instead of having to go inside the program.
- The ability to chain independent programs together so that they work together as a unit from the command line.

The first enhancement builds on the existing CP/M command structure but adds the ability to branch (with if/else/endif commands) and loop (with a next command) and to use variables. These capabilities are intended to be used in programs known as Macros.

Macros are programs made up of operating system commands. CP/M provides a rudimentary macro capability in its submit command. You may recall that if you write

```
A>SUBMIT JOB PROG
```

then CP/M will look for a file, JOB.SUB, and will proceed to read it and execute its commands line by line. You can pass variables to the .SUB file (for example, PROG). Specifically, JOB.SUB may contain

```
PLI $1
LINK $1 [NL,NR]
$1
```

When you write

```
A>SUBMIT JOB PROG
```

Submit will put this together with the contents of JOB.SUB and generate the command sequence,

```
A>PLI PROG
A>LINK PROG [NL,NR]
A>PROG
```

CLIP's macros are like an extended SUBMIT capability. The first difference you'll notice is that you don't have to type SUBMIT or any other keyword; just typing the name of the macro invokes it.

One exception to this is that you're allowed to use the same name for a macro and for a .COM file. This means that you say MACRO <file> if you want the macro or EXEC <file> if you want the .COM file. The macro language includes branching, controlled by ifs, thens, and elses so that you can bypass certain steps if necessary, and looping, so that portions of the macro can be repeated if desired. It also gives you a more flexible set of variables so that you can work with character strings, numbers and even data generated by programs run from inside the macro.

You have ten numerical variables, ten string variables and three file variables. If these aren't enough, you can stack these working variables, along with CLIP's current state, by means of push and pop commands. Push causes these items to be saved in a file on your disk and the pop command restores the most recently pushed values. CLIP's state is also pushed before execution of any program and before signing off and returning to CP/M.

The macro concept seems heavily influenced by Unix, although it is implemented, in one form or another, in almost every important command processor today.

Learning to write and use macros effectively will take time and practice. This is true of all macro languages. I have yet to see a well-planned introduction to macros.

You need to build up your repertoire of instructions gradually, as you do with any other language. The best way to get started is to find someone who already knows the language. Once you have mastered the language, you can write extraordinarily powerful programs simply by stringing together existing programs by means of macros. Most often, the reason for buying the software tools offered by Thoughtware is to have a set of handy primitives out of which to make macros.

Why should you write a command-language macro to do something when you could just as well write a program to do the same thing. After all, what is Basic for? There are a number of answers to that.

For one thing, Basic is not very good at invoking other programs other than by chaining them and it cannot invoke programs which aren't themselves written in Basic—e.g., text editors. Even something as simple as the compile-load-and-go example in JOB.SUB is beyond the reach of all Basics known to me.

Another answer is that there frequently are jobs to be done which: require functions for which programs already exist (so you would rather not have to rewrite them just for this problem); require a rather complicated and variable sequencing of these functions, so that it's not practical to pack the commands into a SUB file; and are repetitive, so you must babysit the terminal if you are going to do the whole thing by hand.

I/O Redirection

I/O redirection works this way: Many programs are designed to accept their input from your CRT keyboard and to deliver their output to your CRT screen. Occasionally, it would be handy to be able to send the output to a file, instead.

Traditionally, the only way to do this is to rewrite the program, including code for obtaining the filename from the user, opening the file, writing to the file, closing the file and maybe a few other things.

The writers of the Unix operating system pioneered a different way: you can instruct the computer to redirect the output of the program to a special file. If you write

```
% prog
```

(% is the Unix prompt), then the input to PROG is assumed to come from the keyboard and the output goes to the CRT screen. But if you write

```
% prog >outfile
```

then the output of PROG automatically is redirected to OUTFILE.

That is, OUTFILE is opened (and created too, if that's necessary) and the output of PROG is automatically written into OUTFILE instead of being displayed on your CRT screen.

Similarly, if you write

```
% prog <infile
```

then PROG will ignore your terminal and take its input from INFILE instead.

The only difference in the CLIP version is that the redirection must be indicated

as an option switch: that is, you don't just write

```
A) PROG >OUTFILE
```

but must write

```
A) PROG/>OUTFILE
```

This doesn't look as nice as the Unix/CP DOS version, but it was a lot cheaper to implement.

On the other hand, CLIP gives you a feature which Unix doesn't: I/O redirection has been expanded to permit a simultaneous display on your CRT screen. If you write

```
A) PROG/>FILE
```

the output of PROG goes to FILE instead of to your terminal; but if you write

```
A) PROG/>&FILE
```

the output of PROG goes to FILE and also to your terminal. Similarly,

```
A) PROG/<&FILE
```

reads the input from FILE but also displays what it reads on your CRT. Of course, your input file must be in ASCII characters for this to make any sense. This sounds like an admirable debugging tool.

Once you are used to this concept, you tend to design programs with the assumption that they will have a standard input and a standard output which default to the terminal but can be redirected at will. In fact, you come to think of programs as big boxes with an input at one end and an output at the other.

Pipes

The next stage is clearly to cascade these filters, so the output from one program becomes the input to the next. A sequence of these filters can be imagined as a big pipeline, with data gradually flowing through it, from filter to filter, until it finally appears on your screen or comes to rest within some file. These program sequences are, in fact, known as "pipes."

In the Unix system, the notation is as follows:

```
% prog1 | prog2 | prog3 >outfile
```

the symbol "|" represents the coupling between successive programs. In this example, PROG1 gets its input from the keyboard, passes its output to PROG2, which passes its output to PROG3; the output of PROG3 ends up in the file OUTFILE.

These features are now proliferating outside of Unix. Most notably, they have been incorporated in the latest version of IBM's PC DOS for their personal computer. And they have been implemented in CLIP with essentially the same notation; you write

```
A) PROG1 | PROG2 | PROG3/>OUTFILE
```

I should mention one difference between Unix pipes and these others. Unix is a multitasking system. That is, it can make the computer work at many different tasks at once.

One of the most common applications of this principle is time-sharing a computer among many different users, all of whose programs can be run at once. Each program becomes a task; the computer allocates a short time slice to each task and also drops tasks whenever they have to wait for an I/O operation, picking them up again after the operation is complete.

When you create a Unix pipe, all the programs piped together are started at once, each one as a task, and data emerging from the standard output of Program 1 is immediately picked up by Program 2—and so on. CP/M 2.2 is not a multitasking operating system, which explains its slightly different operation.

The programs making up the pipe are run one at a time. CLIP puts the standard output of Program 1 into a temporary file named PIPE.$$$. When Program 1 finishes and Program 2 starts up, Program 2 reopens PIPE.$$$ and reads its input from there. Hence

```
A) PROG1 | PROG2
```

operates as if it were the sequence,

```
A) PROG1/>PIPE.$$$
A) PROG2/<PIPE.$$$
```

This may be a minor point, but it's worth knowing about because PIPE.$$$ occasionally shows up in your directory if one of the programs bombs before the sequence is finished.

Occasionally there are other consequences. I ran this review through SPELL, the spelling checker which is part of The Word Plus package from Oasis Systems.

I thought it would be nice to see the list of misspelled words in lowercase for a change, so I piped SPELL's output into the CLIP lowercase command. SPELL usually tells you what it's doing: "Compiling Word List," "Checking Main Dictionary," and so forth; but I never saw any of these messages because they were all being redirected into PIPE.$$$. After SPELL had terminated & LCASE took over, then for the first time these status messages, long out of date, began to appear. This problem is inherent in this way of simulating a pipeline, but fortunately it doesn't hit you very often.

In my experience, I/O redirection is extremely handy; pipes are handy only if you have a large repertoire of programs built around the concept of standard input and output. For utilities which are run hundreds of times, it's usually better to have one special program that does the whole job in a single step. For example, the CLIP manual shows this sequence of commands:

```
A) DIR/W:1 | SRT
```

which produces an alphabetically-sorted directory of your disc. But it's only one column wide and will go scrolling down your CRT screen endlessly so that you will never see the whole thing at once. I have no doubt that, given sufficient time and sufficient ingenuity, you can cause it to present four columns all in alphabetic order—but why bother? The well-known public-domain directory program, XDIR, will give you exactly what you want, with (in my version, anyway) the write-protect status of each file.

CLIP Commands and Software Tools

There are a lot of commands and software tools available with the CLIP package; I'll touch on a few of the interesting ones here.

There is a line editor, named UEDT. It is a wonderful boon if all you have had in the past was ED, but I found it no better than any other line editor when compared to a good screen editor. My first step after familiarizing myself with CLIP was to delete UEDT from my disc forever and go back to Word-Master. There's really no alternative.

There is a wonderful desk-calculator program named CALC. It is handy and takes virtually no time to run, since it's in memory already and doesn't have to be loaded from anywhere. Having recently tried the Lisa calculator as well as CLIP's I must say that for looks Lisa is way ahead, but for doing anything useful, I'll take CLIP.

Using CLIP you don't have to take your hands off the keyboard; you get logical operations in addition to the usual four functions; and because there's also a RADIX command, you can do calculations in any base from two to 16. (So long, TI Programmer!) My only regret is that they didn't extend its range to 32-bit numbers. But the most important thing is that you can use it for only one operation at a time. You can't say

```
A) CALC
```

and then do half-a-dozen different calculations, or possibly the same calculation on half-a-dozen different sets of numbers, without reinvoking CALC.

and then do half-a-dozen different calculations, or possibly the same calculation on half-a-dozen different sets of numbers, without reinvoking CALC.

This is inherent in the whole software tools concept: tools tend to be one-shot operations because they have to be to fit into pipes. Of course, you can probably create a macro which gives you the illusion of not reinvoking CALC. This ability is typical of languages with an extensive command-language macro facility, by the way. You can always macro yourself out of any tight spot.

SET is used for altering file attributes. It replaces CP/M's STAT function and in my opinion is far superior to STAT. If you wish to make a file read-only, CP/M requires that you do

```
A>STAT FILE $R/O
```

There will then be a pause while CP/M loads STAT from the disk and figures out what to do with it when it's loaded. If at any point in the process you should touch as much as one key, you'll get the message

```
**Aborted**
```

and you'll have to do the whole thing all over again. With CLIP you write

```
A) SET/R FILE
```

and it's done, with no pause or abortion.

CLIP's file deletion command, DEL, seems identical in all respects to CP/M's ERA, except for the trivial difference that you can get DEL to omit the "not found" message if you wish. (It may be desirable to suppress the message if DEL is in a macro.)

The more important verify option (which allows you to go through an entire disc and delete or not by answering "y" or "n" for each file) doesn't appear, mainly because details of the CP/M file searching operations prevent it.

DIR, similarly, isn't significantly better than the CP/M DIR, and both are inferior to XDIR and its congeners.

COPY and REN (rename) both incorporate a language decision that is a near disaster. There are two general ways of indicating old and new files in operations of this sort. In CP/M and a lot of other systems deriving ultimately from early DEC systems, the convention is to use

```
<new> = <old>
```

For example, to copy a file, we write

```
A>PIP NEWFILE = OLDFILE
```

This makes a kind of sense, because we all associate the equals sign with transferring what's on the right-hand side to the left-hand side. More modern systems have taken to omitting the equals sign, and they use

```
<old> <new>
```

without any punctuation in between. So you quickly learn the rule: if the equals sign is there, follow the PIP convention; if not, do it the other way. I have yet to destroy a file under either of these conventions.

So now comes CLIP, and what do you suppose they do?

```
COPY <new> <old>
REN <new> <old>
```

This is a sure death-trap for any user who has to work with many systems. I understand that the sequence is changed to the standard one in new releases. In the meantime, the easiest solution to this is to write a Macro which will take these two names and reverse their sequence. This is another instance of using the macro capability to avoid a sticky situation.

The package includes provision for setting and obtaining the data and time. It only provides for these operations, however; it doesn't actually implement them. The program's provision consists of commands and hooks with which the user attaches routine implementations.

The documentation of these routines and exactly how they are supposed to interface with the commands is sketchy, however, and it would probably require a fair amount of experimentation to get them working. It is assumed that you have a hardware clock/calendar somewhere on your bus and that your routines will set and read time and date using this board.

Many of the software tools are for text manipulation, most notably editing, selecting, padding and sorting. One of the purposes of these tools is to facilitate writing macros.

Macro commands are usually clumsy in their ability to select operands. Using XW to put each word of a file on a single line, for example, or using XC to isolate selected columns in the file makes it easier for other commands to get at the desired operands.

The file encryption program uses a single keyword. This word is used to generate an 89-bit seed for a random-number generator which then spins out as much key as the size of your file requires. The ciphertext is generated by an exclusive-OR between the key and the plaintext. This is a pretty secure system, although methods for cracking random-number generators are not unknown (but not easy, either).

General Comments

Perhaps the most important observation is this: CLIP is *not* copyprotected. I can't live without the reassurance of backup copies, and I won't buy or recommend any software which you can't back up as much as you need. Yes, I think the piracy problem is terrible, and I'm willing to do everything I can to combat it, but I draw the line when the software by which I live is at risk. I'm happy to be able to recommend CLIP to you.

CLIP is extensively user-modifiable. Suppose you can't break yourself of the habit of using ERA to delete files; you can actually enter the command table using DDT and change DEL to ERA for your personal convenience.

The choice of editing keystrokes mainly follows that of WordStar; but if you would rather have it conform to another arrangement, you can get at all of those keystrokes as well and change them as you will, again using DDT. You can even change the prompt by means of a CLIP command, although after a brief experiment using

```
Hey, Stupid!
```

I reverted to

```
A)
```

and have not changed it since.

The one real problem CLIP has is that it is *big*. By my count, the basic package requires

Com files	28K
Overlays	22K
Message files	72K
Total	122K

If you also buy the programming tools, these require 98K more. Furthermore, these files must all be on your main disk—that is, on Disk A. If, as I do, you have a set of disks: one for text processing, one for Fortran, one for PL/I, one for Basic, one for Lisp, one for number crunching and graphics, you will want a complete set of CLIP files and tools on each one of these discs—and you'll find, as I did, that there isn't room for them all. (It's particularly difficult on the text processing disk, which already has an enormous chunk of space given over to the 40,000 word spelling dictionary.) Of course, you can drop the Help files once you have mastered the system, and you may decide there are software tools in the kit which you will never need. But CLIP will still be taking up a sizable amount of space.

CLIP also introduces a slight delay into the execution of any transient program. This is because there is an extra layer of control involved: first you go through CLIP and then through CP/M. Since CLIP's state is always pushed before a program, there is at least one disk access. Some CLIP commands also require access to the CLIP.OVL file for execution. It's these extra disk accesses that cause most of the delay. Of course, if you are using any of the popular memory disks, which use random-access memory to simulate a super-high-speed disk, this problem vanishes.

A newer version of CLIP will give the user the option to leave portions of it resident in memory, so that there will be fewer delays in reading overlays from the disk. My own feeling is that because of the extra disk accesses and the large amounts of disk storage required for the program in the first place, CLIP really comes into its own in hard-disk systems, where you have plenty of room and access times are short.

I found the documentation good for the first time around. Most documentation benefits from a few revisions. Every command is described twice—once in a summary, where it is grouped with similar commands and the whole group is discussed, with examples, and once in an alphabetical listing where each command gets an article of its own. This second listing seems to be copied from the Unix documentation style. When I say copied, this is high praise: the best software is developed by selectively copying features found elsewhere. There is a table of contents and an index.

The current version of CLIP is written for the Z-80, not the 8080. Versions for other processors will be forthcoming soon; first in line is an 8086 version (which may be out by the time this appears), but CLIPs for the 8080 and the 68000 are also in the works. There is some disagreement over whether CP/M will continue to be the *de facto* standard operating system for these larger processors; the availability of an enhancement as cheap and powerful as CLIP is going to give CP/M a greater competitive advantage than it may otherwise have had.

Thomas W. Parsons
Brooklyn, NY

Simplify your Graphing Style on Apple
VisiCalc IV: Spreadsheets to Graphs
IBM's Interpretive Approach to Graphs
A Nonintegrated Inventory System for IBM

pfs:GRAPH

System Requirements: Apple II, II Plus or IIe; one disk drive; a printer or the Hewlett-Packard 7470A plotter; a color monitor is supported.
Manufacturer: Software Publishing Corp., 1901 Landings Drive, Mountain View, CA 94043.
Price: $125.

The acronym KISS stands for: *Keep It Simple, Stupid!* pfs:Graph, from Software Publishing Corp., is a program that makes data display easy.

It is written in Pascal and supports line, bar and pie plot graphs.

The program lets you enter data in three ways: data interchange format (DIF) VisiCalc files, PFS files and directly from the keyboard. You can combine line and bar drawings in one display. Up to four different graphs can be printed on one pictorial chart. Bar and line drawings can be stacked on top of each other. Figs. 1, 2 and 3 are examples of the different printouts that are available and are explained below.

For this review I used an Apple IIe with an 80-column card and the IIe version of pfs:Graph. The documentation makes reference to the 80-column text card, but instructions for it are vague and I was never able to bring it up. However, the card would not have added to the utility of this program anyway.

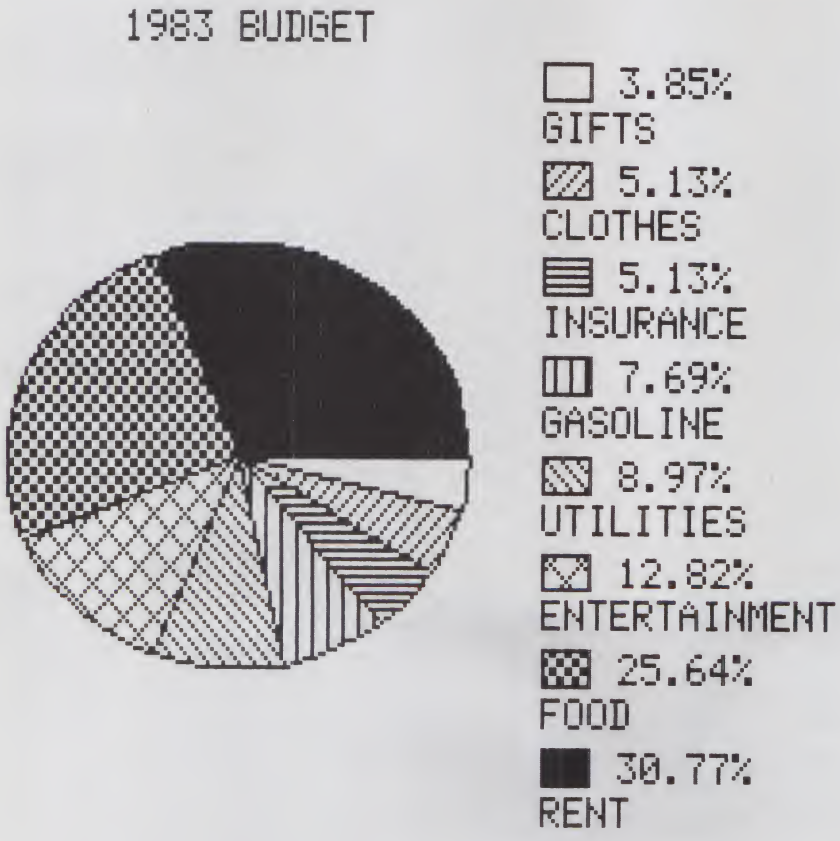


Fig.1. A pfs:Graph pie chart showing a 1983 budget.

What You Get

The package comes in the familiar "*pfs:*" box. You get two program disks, copy protected, and one sampler disk, which may be copied. I applaud the immediate inclusion of a backup for uninterrupted use of the program.

In addition, there is an 80-page manual. It contains a table of contents, a short tutorial, descriptions of the various functions and a quick reference card as well as a glossary of terms and an index. The manual contains excellent photographs of screen examples.

While the introductory tutorial is short, it really touches on everything you need to know. It is a good idea to work through the six chapters because they explain the different functions.

If your data is in raw form and you plan to type it from the keyboard, data entry is simple. Entries for the x axis (horizontal direction) can be expressed as dates, numbers or names. Once data has been entered, you cannot change the x data format. Up to 36 data points can be plotted on one graph.

If you have a lot of information from another program such as VisiCalc or pfs: File, pfs:Graph will read and enter data directly. VisiCalc files have to be saved in DIF, which is a simple procedure.

I constructed a small model using the 1983 Budget in VisiCalc. It consists of three columns, A, B and C, and of 12 rows. Only columns B and C from rows 4–11 were saved as the DIF file

(Continued on p. 138)

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